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WAVETEK

8159 ENGINEER ROAD, SAN DIEGO, CALIFORNIA

INSTRUCTION MANUAL

MODEL 201
AND
MODEL 202

DIALAMATIC VOLTMETER

Good for unit Serial Numbers
096001 through 136999.

WAVETEK ®

8159 ENGINEER ROAD, SAN DIEGO, CALIFORNIA

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WAVETEK
off
+ − ac
function
1V 10V 100V 1000V
range
high
low
% of range
10 1 0.1
tvm
meter
DIALAMATIC Voltmeter
Model 202

WAVETEK
function
range
high
low
% of range
tvm
meter
DIALAMATIC Voltmeter
Model 202

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WARRANTY

WAVETEK warrants instruments manufactured by it to have met WAVETEK's published specifications at the time of shipment of such instruments, and agrees to repair within one year of shipment, such instruments or their components (excluding batteries), which under normal use are found to be defective as a result of our manufacturing. Our obligation under this warranty is limited solely to repairing any such instrument which in our sole opinion proves to be defective when returned to our factory. Transportation to the factory is to be prepaid by purchaser. Instruments returned to the factory will be accepted only when prior authorization has been given by a representative of WAVETEK.

This warranty does not apply to any of our products which have been repaired or altered by persons not authorized by WAVETEK, or not in accordance with instructions furnished by us. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

WAVETEK assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. WAVETEK assumes no liability for secondary charges or consequential damages, and in any event, WAVETEK's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and as to which a claim is made.

Any recommendations made by WAVETEK for the use of its products are based upon tests believed to be reliable, but WAVETEK makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for us any liability in connection with the sale of our products other than set forth herein.

SECTION I
GENERAL DESCRIPTION AND OPERATION

GENERAL

The WAVETEK Models 201 and 202, DIALAMATIC Differential Voltmeter, are precision voltage measuring instruments. The Model 201 measures d-c voltages (10 mv resolution), while the Model 202 measures both d-c and a-c voltages (from 1 mv to 1000 volts full scale). Both models are of all silicon design and available in battery powered "B" versions for complete isolation from the line. With the top cover removed, the glass-epoxy printed circuit boards swing out (as illustrated) for easy troubleshooting and maintenance.

The speed at which the voltmeter can be nulled by the operator makes the instrument ideal for use on a production line as well as in the laboratory. It is this speed of operation that makes the DIALAMATIC Differential Voltmeter unique. The increase in speed is due to the TRANSFERMATIC switch action coupled with a null amplifier which never loses sense and an amplifier-meter output indicator with sufficient band width and step response that the operator will never become confused or lose time waiting to see what effect his last adjustment is going to have on the reading.

The null amplifier is a non saturating type allowing the operator to dial an unknown voltage on the most sensitive range of the instrument. The TRANSFERMATIC switch automatically moves the adjacent digit or digits when a transfer point is reached, making it unnecessary to reset all switches as compared to a conventional differential voltmeter. This also allows easy tracking of drifting voltages without the switching confusion of individual switches.

To determine the polarity of an applied voltage, the TVM (Transistor Voltmeter) mode can be used. It is then only necessary to select the proper polarity and start turning the dial at the left in the direction that the meter indicator should move. When the indicator swings to the opposite side, the second dial is turned in the direction that the indicator should move. Following the same process through the dials from left to right, a null can be achieved without resetting all digits to zero and without resetting all switches when transfer points are reached.

BATTERY CHARGER

The Model 201B incorporates an internal battery charger. The Model 202B incorporates two separate and independent battery chargers. These units will operate continuously for 16 hours from the internal batteries. It may be charged completely in 16 hours. The charger is designed so that charging occurs while the unit is in operation. A screwdriver adjustment (two adjustments for the Model 202B) enables the operator to set the desired charge

rate. In the maximum clockwise position, the charge time from discharge to charge is 14 hours. Frequency operating with the instrument plugged into a-c power with the charge rate set this high could result in damage to the batteries. The maximum counter-clockwise position of the rear control sets the charge rate to maintain the batteries at full charge without overcharge. The units are wired so that when plugged into a-c power, but turned OFF, a trickle charge maintains the batteries at full charge setting.

In the Model 201B or 202B, when the switch is in the OFF position, the batteries are disconnected from the instrument but connected to the charger. In this position the charger is set for a trickle charge when the instrument is connected to line power. In the other positions, the batteries are connected to the instrument for normal operation. If the instrument is not connected to the line power, the batteries are discharging; but if connected, the charger supplies sufficient current to operate the instrument and charge the batteries. The amount of charge current available is variable through the potentiometer at the rear panel. In the maximum counter-clockwise rotation, the charge current is minimum. In the maximum clockwise position, the charge current is maximum. The maximum counter-clockwise position is recommended for optimum battery life unless maximum charge rate is required due to duty use cycle.

CAUTION

If the batteries are allowed to completely discharge, at first the instrument power supply cannot provide adequate power to simultaneously operate and charge. If this condition exists, the instrument should be plugged in and turned ON to allow the batteries to recharge for a period of time before it is used.

COMMON MODE AND GROUNDING CONSIDERATIONS

A potential difference generally exists between different points on power systems ground. If the input low of the voltmeter is connected to the chassis ground post at the voltmeter, the voltmeter will read the sum of the input signal and the potential difference along the power systems ground. This potential difference is known as a common mode voltage since it is common to both the high and low input lines. See figure 1-1. The common mode voltage may be a-c as well as d-c. Under these conditions, the input should not be grounded at the voltmeter. Under certain conditions it may be desirable to ground the meter as when no common mode voltage exists. To maintain the high common mode rejection, the leakage resistance from the circuitry to chassis ground has to be extremely high to reduce the ground loop currents. These currents couple resistance which is in the input loop (see figure 1-1).

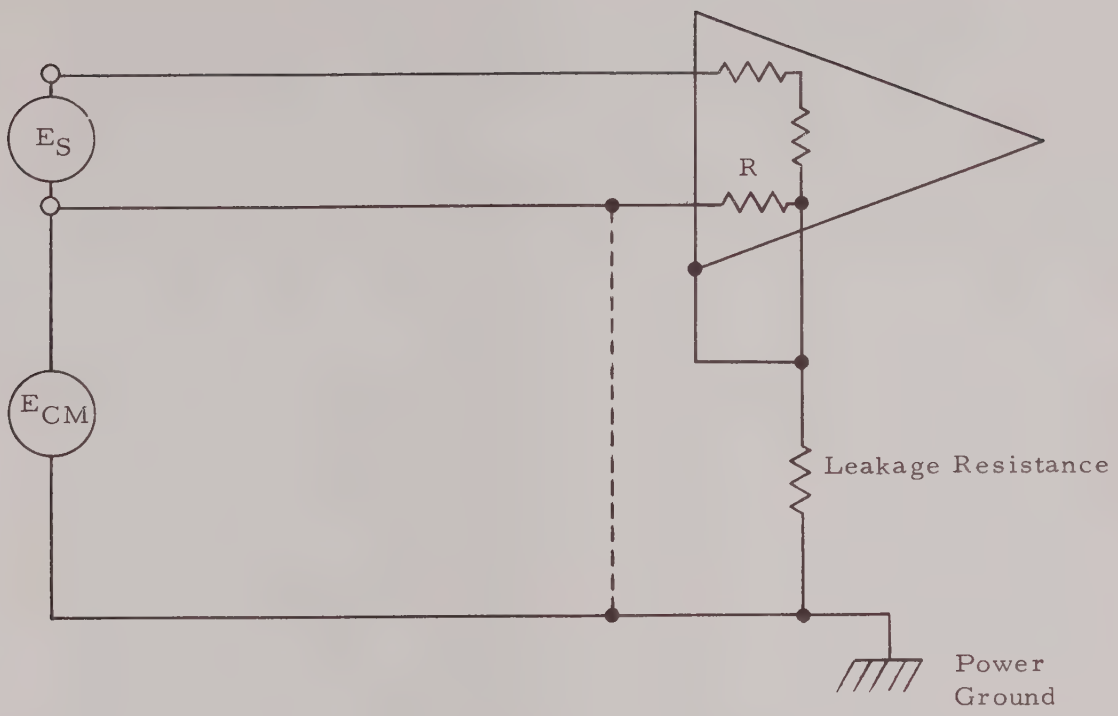


Figure 1-1.

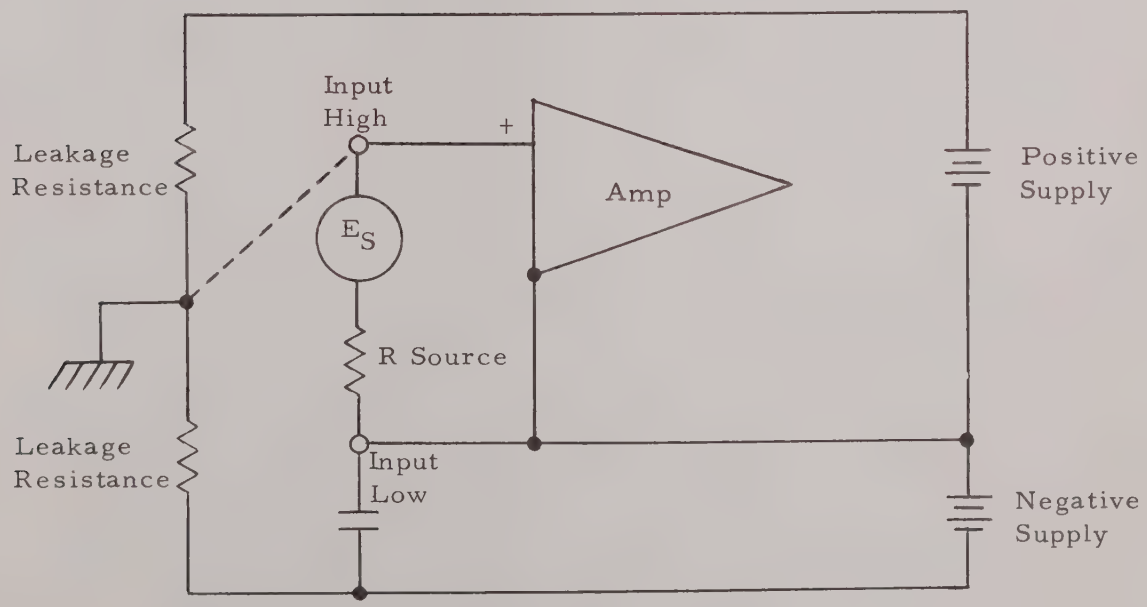


Figure 1-2.

Great care should be exercised when servicing the meter so it does not become contaminated resulting in a lower leakage resistance. Leakage resistances to the chassis in the order of $10\Omega^{11}$ from the null amplifier common and much higher than the above from the input attenuator, are necessary to insure the common mode performance. Since leakage resistance is dependent upon dampness, the common mode measurements should be made with a relative humidity below 70%. Also, for higher common mode voltages, the measurement should be made several minutes after application of the voltage since it takes time to charge stray capacities to ground through very high leakage resistances.

The leakage resistance from the power supplies to power ground form a high impedance bridge which is very hard to match (see figure 1-2). Accuracy can suffer if the positive input of the amplifier is grounded and the source resistance is high. For source resistances of 100K or less, generally there is no loss in accuracy if the positive input of the amplifier is grounded. If it is necessary that this input be grounded, the meter should be zeroed.

A 0.01 μf capacitor is connected from the input low to chassis ground to reduce the effect of a-c leakage currents from the power transformer. It is possible under some conditions, such as when making common mode tests, for this capacitor to acquire a charge. Since in subsequent tests an error may exist until this capacitor discharges, the input low should be shorted to chassis to provide a low impedance path for discharge.

SECTION II
SPECIFICATIONS AND TEST PROCEDURES

This section contains specifications for the WAVETEK DIALAMATIC Voltmeter, Model 201 (d-c) and Model 202 (a-c and d-c). Also included in this section are procedures for testing their accuracy.

DISPLAY

Four TRANSFERMATIC digital dials, including one vernier dial calibrated to two digits, resulting in 5-digit resolution; mirror scale taut band null detection meter.

INPUT

0 to 1000 volts d-c.
*1 mv to 1000 volts a-c.

NOTE

The unit is supplied with front input as shown. Rear input is available optionally at no additional cost.

SELECTABLE VOLTAGE RANGES

1 volt, 10 volts, 100 volts, and 1,000 volts (decimal indicator automatically coupled to range switch).

POLARITY

Front-panel selected plus (+) and minus (-) and a-c.

RESOLUTION

10 μ volts (1/2 of minor division on mirror scale of null meter).

NULL RANGES

Full scale sensitivity is ±0.1%, 1% and 10% of selected voltage range and TVM.

NOTE

Normally used in most sensitive position because of non-saturating null amplifier.

D-C INPUT IMPEDANCE

Infinite at null in 1 volt and 10 volt ranges, 10 megohms at null in 100 volt and 1,000 volt ranges.

*A-C INPUT IMPEDANCE

1 megohm and 40 pf.

D-C ACCURACY

±0.01% of reading ±0.001% of selected voltage range ±10 μ volts.

*A-C ACCURACY

±0.2% of reading ±25 μ volts, 20 Hz to 10 KHz, 0.001 volt to 1,000 volts.

±1% of reading ±25 μ volts, 10 KHz to 20 KHz, 0.003 volts to 1,000 volts.

REFERENCE STABILITY

±0.002% after 15 minutes' warmup at constant temperature and line.

COMMON MODE REJECTION

With 1 Kohm unbalance in either side of input: 130 db at d-c, 100 db at 60 Hz, 82 db at 400 Hz in 1 volt and 10 volt ranges; 100 db at d-c, 70 db at 60 Hz and 52 db at 400 Hz in 100 volt and 1,000 volt ranges.

NOTE

Ni-cad battery versions provide complete line isolation.

TRANSISTORIZED VOLTMETER (TVM)

1, 10, 100 and 1,000 volts full scale.

Accuracy 3% of full scale.

RECORDER OUTPUT

±300 mv proportional to null reading; output impedance 10 Kohm.

ENVIRONMENTAL

Specifications apply for 25°C ± 5°C. For operation from 0°C to 50°C, derate by a factor of 3.

POWER REQUIREMENTS (Models 201 and 202)

115 volts ± 10% or 230 volts ± 10%, 50 Hz to 400 Hz, less than 5 watts.

POWER REQUIREMENTS (Models 201B and 202B)

Ni-cad rechargeable battery with built-in charger; 115 volts ±10% or 230 volts ±10%, 50 Hz to 400 Hz, less than 10 watts. Simultaneous charge and operation; 16 hours of operation for every 16 hours of charge.

DIMENSIONS

7 and 3/4 inches wide, 5 and 1/4 inches high, 10 inches deep.

"B" Models:
7 and 3/4 inches wide, 5 and 1/4 inches high, 11 inches deep.

WEIGHT

Models 201 and 202: 8 pounds.

Models 201B and 202B: 10 pounds.

TEST PROCEDURES

GENERAL INFORMATION

Instruments should be within specifications within 15 minutes' warmup time. Unless otherwise stated, all specifications are for 25°C ± 5°C and 105 to 125 volts a-c, 50 Hz to 400 Hz. Each measurement shall be made on the range giving the greatest resolution.

TESTING INFORMATION

Using a d-c voltage standard such as the Kintel 326 or an equivalent, is the preferred method of checking the d-c accuracy. The desired voltage can be dialed for the standard and a reading obtained with the differential voltmeter. The difference on the 1 volt range for a reading of 0.9500 volts should be less than 0.000115 volts, plus the inaccuracies of the standard. This is figured as follows:

0.01% of the reading =	0.000095 volts
+0.001% of selected range =	0.000010 volts
+10 μ volts	0.000010 volts
+Errors of the standard	0.000000 volts
	0.000115 volts

The difference on the 1 volt range for a reading of 0.1000 volts should be less than 0.000030 volts, plus the inaccuracies of the standard.

0.01% of the reading =	0.000010 volts
+0.001% of selected range =	0.000010 volts
+10 μ volts	0.000010 volts
+Errors of the standard	0.000000 volts
	0.000030 volts

The preferred method of checking the a-c accuracy involves the use of the following equipment or its equivalent:

1. Optimation 104A (Stable A-C Source)
2. Holt 6A (Transfer Standard)
3. Kintel 326 (D-C Voltage Standard)

The magnitude of the a-c source is determined by using the thermal transfer to adjust the d-c standard voltage equal to the a-c source. The measurement using the Model 202 shall differ from an a-c voltage of 0.9500 volts

by less than 0.001925 volts, plus any inaccuracies of the measuring device. Assuming there are no errors from the measuring devices, the difference is computed as follows:

0.2% of the reading =	0.001900 volts
+25 μ volts	0.000025 volts
	0.001925 volts

This will apply to frequencies from 20 Hz to 10 KHz, and for magnitudes of 0.001 volts to 1000 volts.

SECTION III
THEORY OF OPERATION

A simple block diagram of the differential voltmeter mode is shown in figure 3-1. In its simplest form, the differential mode consists of a series circuit of the unknown input voltage (E_S), an accurate floating and adjustable bucking voltage (E_B), and a null amplifier driving a meter to read the difference between E_S and E_B. The polarity of E_B is switchable so that when its magnitude is adjusted to be equal to that of the input, E_B and E_S will subtract and the amplifier will indicate a null. Under these conditions of balance or null,

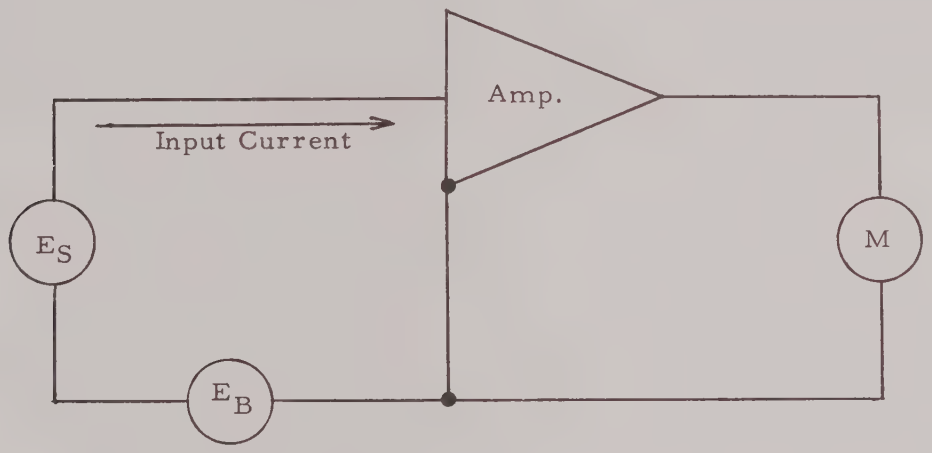


Figure 3-1.

the current flowing across the input circuit will be zero and the input impedance will approach infinity. It is evident that if other leakage paths exist, the input impedance will be limited. Extreme care has been exercised at the factory to keep the voltmeter clean and extra isolation has been provided such as mounting the input posts with extra non-conductive washers to insure the high input impedance.

Figure 3-2 is a detailed block diagram of the differential mode and illustrates in detail the signal flow and how the basic block is expanded for additional capabilities.

INPUT ATTENUATOR

The input attenuator is used to scale down input voltages which are greater than 10 volts. This is necessary since the largest reference voltage used is 10 volts. A reference voltage of 1 volt is used for the 1 and 100 volt ranges. The scaled down input voltage is then balanced out by the bucking voltage as before. The accuracy is now dependent upon the accuracy of the input attenuator. The attenuator is composed of three 3.3 MegΩ and one 100K wire

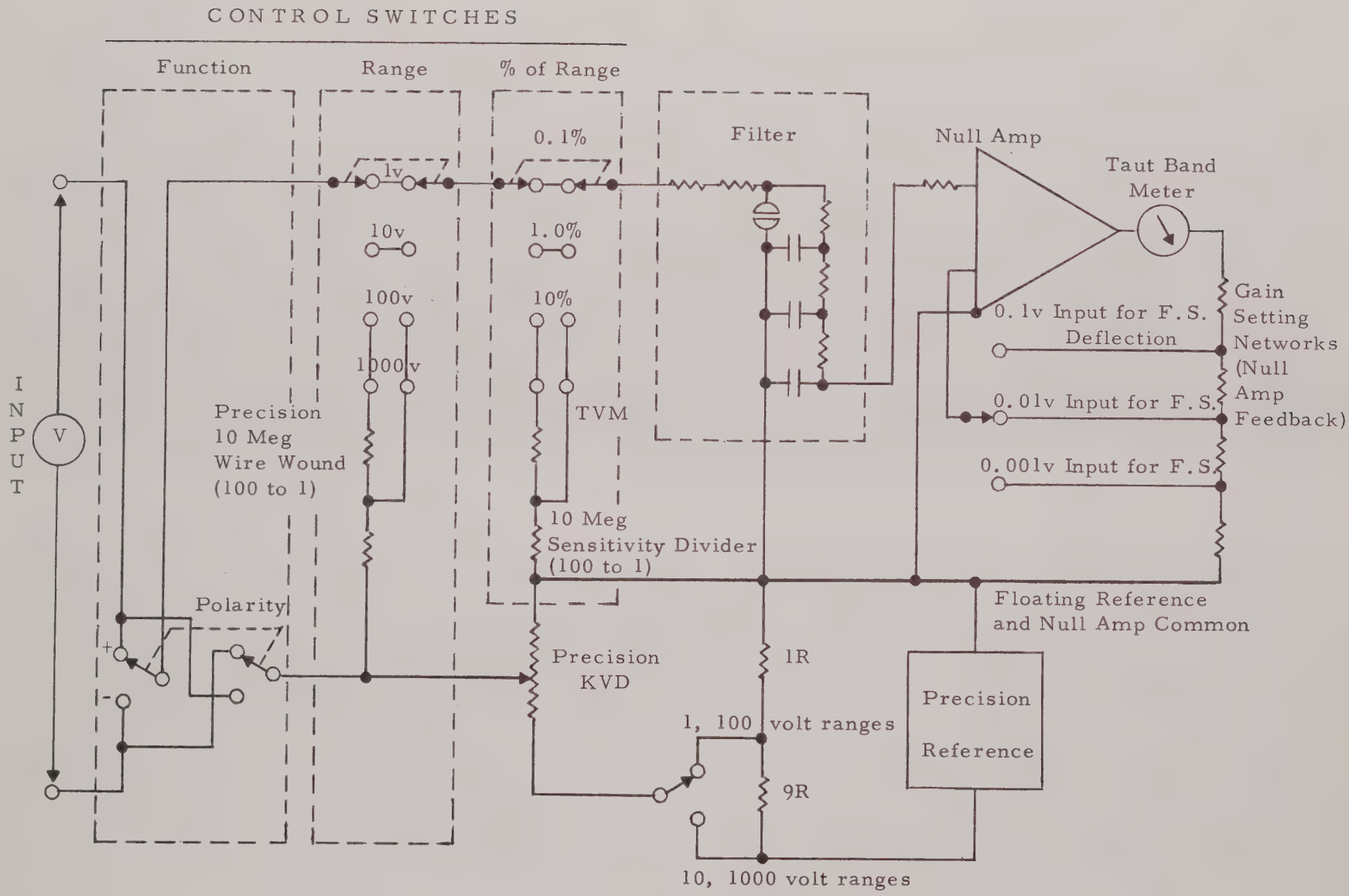

CONTROL SWITCHES
Function
Range
% of Range
0.1%
Filter
Null Amp
Taut Band Meter
1v
10v
100v
1000v
1.0%
10%
INPUT
V
Precision 10 Meg Wire Wound (100 to 1)
TVM
0.1v Input for F.S. Deflection
Gain Setting Networks (Null Amp Feedback)
0.01v Input for F.S.
0.001v Input for F.S.
10 Meg Sensitivity Divider (100 to 1)
Polarity
+
-
Floating Reference and Null Amp Common
Precision KVD
1R
1, 100 volt ranges
Precision Reference
9R
10, 1000 volt ranges

Figure 3-2.

wound resistors for stability and one small potentiometer for adjustment to an exact 100 to 1 attenuation. The input impedance is now limited to 10 MegΩ for input voltages greater than 10 volts.

The null amplifier of the basic block diagram, figure 3-1, has been expanded in figure 3-2 to include a 100 to 1 sensitivity divider, an input filter, the potentiometric null amplifier, and the feedback gain setting networks.

SENSITIVITY DIVIDER

The 100 to 1 sensitivity divider is composed of metal film resistors. At a perfect null, the divider will have zero volts across it and so will not affect the accuracy of the indicated reading. For a null meter indication other than zero, the deflection accuracy is dependent upon the accuracy of this divider. However, metal film resistor accuracies are consistant with the accuracy of the best meter movements available.

INPUT FILTER AND LIMITER

The input filter is a three-pole RC low pass filter designed to give 60 db attenuation at 60 Hz. The filtering is desirable since large AC input voltages could saturate the null amplifier. Two 150 KΩ, 2 watt resistors and the neon tube form an input voltage limiter. This enables continuous application of 1000 volts d-c to the meter, even when the meter is set on the 1 volt range.

NULL AMPLIFIER

The null amplifier is composed of a dual transistorized chopper followed by a d-c coupled differential carrier amplifier with common mode feedback, a full wave demodulator for a d-c to a-c to d-c gain of approximately 200. This is followed by a post amplifier with a gain of approximately 500. The post amplifier has a differential input pair matched for low drift and an output voltage limiter. The input is fed to the emitter of one chopper transistor while the feedback from the output of the post amplifier goes to the emitter of the second chopper transistor. The collectors are common through an adjustable offset voltage to ground. As the two transistors are turned on together, the differential input sees zero volts or ground. With the transistors off, the input differential pair sees the difference between input and output. The switching spikes are effectively cancelled due to the excellent common-mode characteristics of the differential carrier amplifier. The combination of the d-c coupled carrier and the output limiting of the post amplifier give the null amplifier its very rapid overload recovery.

FEEDBACK NETWORK

The feedback network provides for a null amplifier gain of 0.1, 0.01 and 0.001 volts for full scale meter deflection. The amplifier output current

CONTROL SWITCHES			Sensitivity Divider	Input Atten.	Voltage Across KVD	Null Amp Gain (input voltage for full scale deflection)
Function	Range Volts	% of Range				
DC	1	0.1	----	----	1	0.001
+ or -	1	1	----	----	1	0.010
	1	10	X.01	----	1	0.001
	10	0.1	----	----	10	0.010
	10	1	----	----	10	0.100
	10	10	X.01	----	10	0.010
	100	0.1	----	X.01	1	0.001
	100	1	----	X.01	1	0.010
	100	10	X.01	X.01	1	0.001
	1000	0.1	----	X.01	10	0.010
	1000	1	----	X.01	10	0.100
	1000	10	X.01	X.01	10	0.010
TVM	1	---	X.01	----	--	0.010
	10	---	X.01	----	--	0.100
	100	---	X.01	X.01	--	0.010
	1000	---	X.01	X.01	--	0.100
AC	1	0.1	----	----	1	0.001

Table 3-1.

goes through the meter and to the attenuator resistors. This feedback establishes a precise current through the meter and makes the deflection independent of the meter resistance which is desirable since the meter responds to current rather than voltage. R117 is switched in to compensate for the loading of the attenuator on the 100 to 1000 volt ranges for the 0.1% and 1% null sensitivities.

Table 3-1 summarizes the switching logic and signal conditioning. It covers for the a-c (Model 202), d-c, and TVM modes, the range, % of range, or null sensitivity versus sensitivity divider, input attenuator, voltage across the KVD, and the null amplifier gain.

As indicated by the basic block diagram (figure 3-1), the three most important things with regard to accuracy are 1) the precision of the input attenuator, 2) the accuracy of the Kelvin Varley Divider (KVD), and 3) the accuracy of the reference. Wire wound resistors (±5 ppm/^{o}c) are used in all three. The reference utilizes two temperature tested zener diodes. A positive TC is matched with a similar negative TC to assure a near zero TC for the pair.

PRECISION REFERENCE SUPPLY

Figure 3-3 shows the basic block diagram of the reference supply. The amplifier consists of two low drift differential pairs followed by an output stage. As the dirft of the amplifier is low compared to the 12.5 volt nominal zener

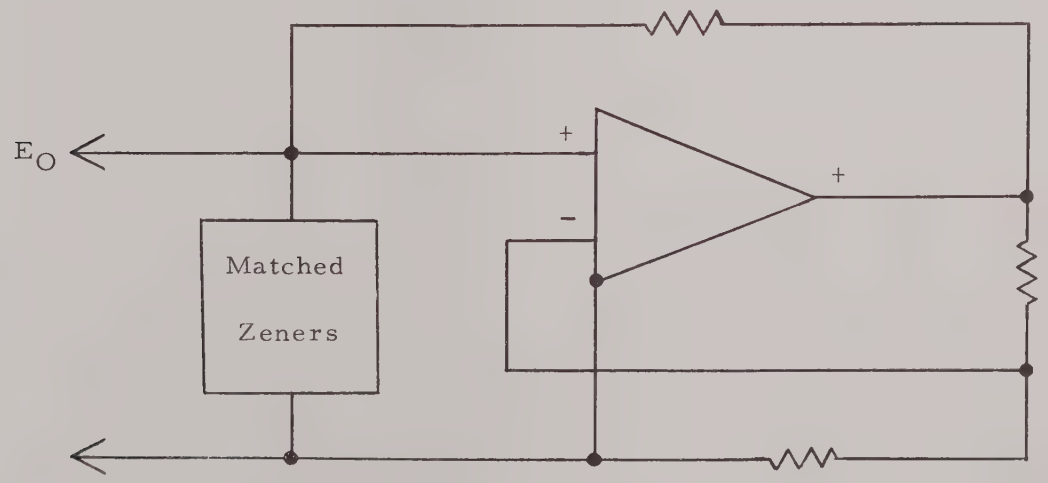


Figure 3-3.

voltage, this combination provides a stable and precise current for the zener diodes and, therefore, forms an accurate reference when the load across the zener is constant.

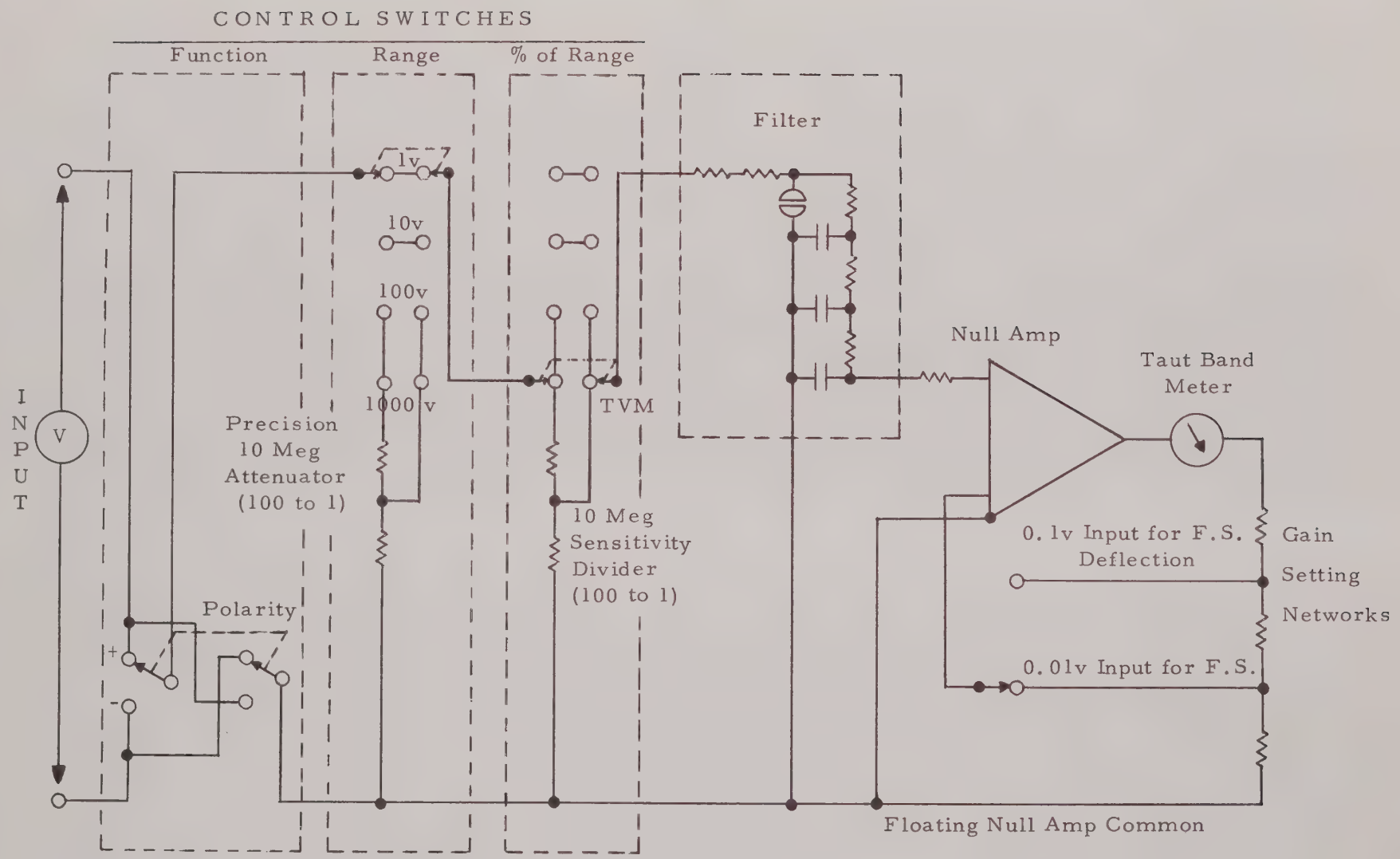

CONTROL SWITCHES
Function
Range
% of Range
Filter
1v
10v
100v
1000v
INPUT
V
Precision
10 Meg
Attenuator
(100 to 1)
TVM
10 Meg
Sensitivity
Divider
(100 to 1)
Polarity
+
-
Null Amp
Taut Band
Meter
0.1v Input for F.S.
Deflection
Gain
Setting
Networks
0.01v Input for F.S.
Floating Null Amp Common

Figure 3-4.

TVM MODE

Figure 3-4 is a detail block diagram of the TVM mode. The meter reads an attenuated input voltage and the deflection is proportional to the input voltage. Four full scale ranges of 1, 10, 100 and 1000 volts are available. The input impedance is 10 megs for all ranges (see table 3-1).

RECORDER OUTPUT

Full scale output of the meter at the recorder output terminals on the back panel is a nominal 350 millivolts. The output is isolated by two 4.7K resistors. The recorder input should be well isolated so there will be no degradation in common mode rejection and no offsets due to circulating ground currents.

A-C CONVERTER

Figure 3-5 is a detailed block diagram of the a-c converter which in a-c mode is switched in series in front of the d-c voltmeter programmed to the 1 volt range. The d-c voltmeter is connected across the rectified and filtered differential output of the a-c converter, thus providing full wave rectification. The two rectified outputs are summed together at point A to provide a feedback signal. The a-c converter is an operational amplifier with sufficient loop gain (greater than 80 db) to insure stability and linearity from an input level of 1 millivolt to 1 volt, which is the full scale output level (from 30 Hz to 10 KHz). The converter responds to the average of the input waveform and is calibrated to RMS. The ranging is accomplished by using a 200K metal film feedback resistor to set the gain on the 1 volt range. This value is decaded lower for the next higher range and down to an equivalent 200Ω for the 1000 volt range. The input resistor is composed of two 500KΩ 2 watt metal film resistors to provide a safe voltage of up to 1500 volts for the resistors, and also provide a lower voltage coefficient. Each feedback resistor is in series with a small potentiometer to adjust the gain. The 1000 volt feedback resistor is the only range not having a variable capacitor, so the capacitors across the input resistor are used to adjust the 1000 volt range high frequency gain. Since this is common with the other ranges, the 1000 volt high frequency adjustment must be made on the 1000 volt range first. The high frequency gain adjustment is always made last. Any d-c component in the a-c input signal is blocked by the 1000 volt 0.5 microfarad input capacitor. This capacitor together with the capacitor at the summing junction (point J) and the capacitor at the diode rectifiers (point B), insures that d-c bias potentials from the input or the amplifier do not add to the rectified a-c output. The high gain amplifier is composed of four differential stages summed with a fifth single stage output transistor. D-c feedback is used from the fourth differential output to stabilize the d-c quiescent potentials. The input differential stage is a pair of N channel field effect transistors to provide low noise with high source impedance and to provide a high impedance load on the summing junction.

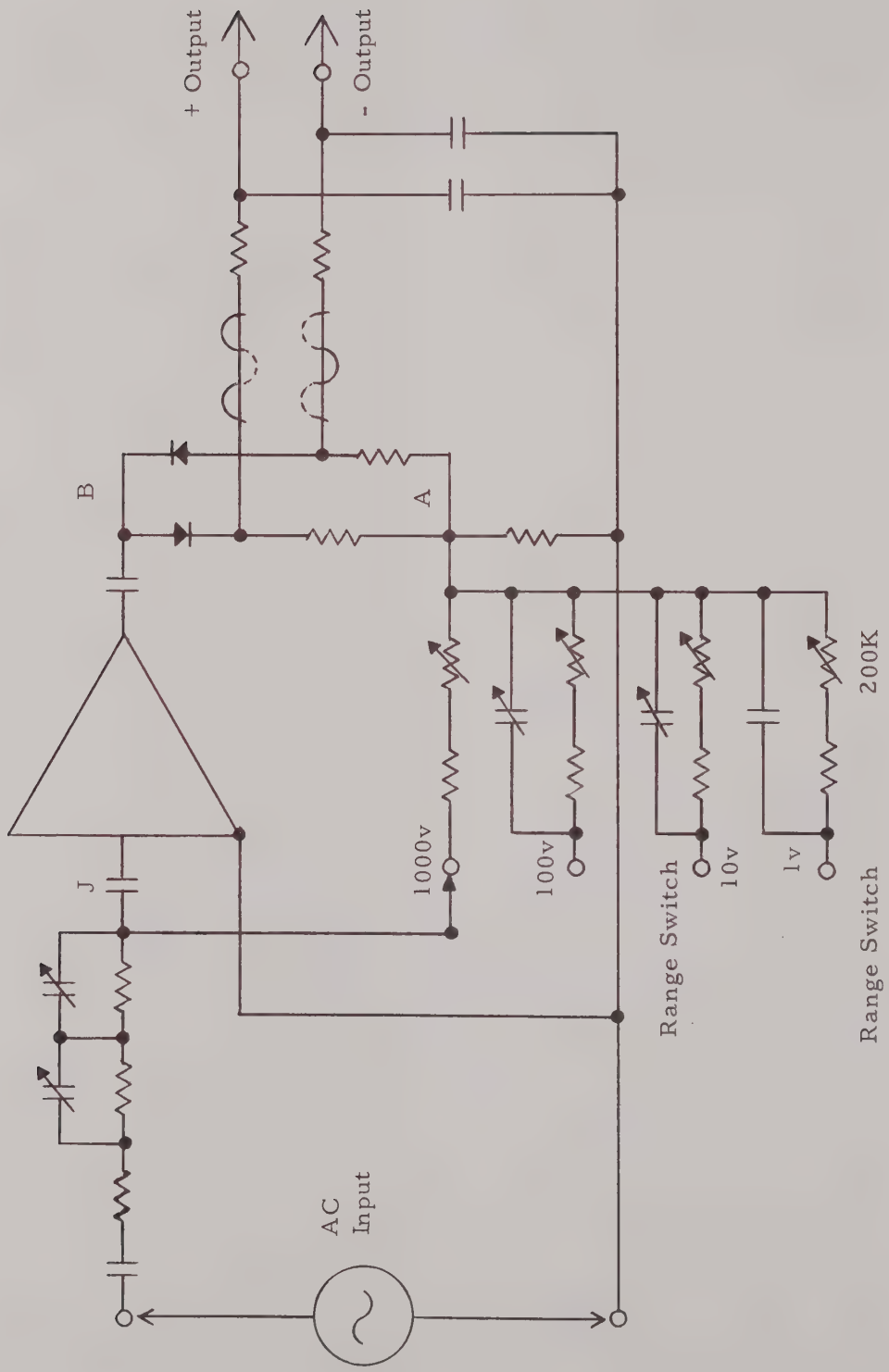

+ Output
- Output
B
A
J
1000v
100v
10v
1v
Range Switch
Range Switch
200K
AC
Input

Figure 3-5.

SECTION IV
CALIBRATION

MODEL 202, D-C SECTION

EQUIPMENT REQUIRED

1. Voltmeter, 0.01% accuracy (WAVETEK Model 201 or equivalent).
2. Oscilloscope, Tektronix 422 or equivalent.
3. D. C. Standard, Kintel Model 326 or equivalent.

To perform calibration of the D-C Board, remove the two left side rails and swing the board out for easy access to calibration controls.

D-C BOARD

There are eight wires connected to the D-C Board that are labeled on the etched side of the board.

17 volts: Connect the proper indicating device between the collector (case) of Q301 and the connector. Adjust R306 for -17.00 volts.

NOTE

R368 is a factory adjust and should not need further adjustment.

D-C BALANCE

To set the d-c balance in the amplifier, connect the proper indicating device between common and the junction of R354 and Q320 and record the d-c level. Remove the measuring device and connect it between connector and the junction of R360 and Q323. Observe the d-c level. The two levels should read the same (maximum difference, 100 mv); if they do not, adjust R349.

SHORT CIRCUIT ZERO

NOTE

Before adjusting the electronic zero control, the mechanical zero of the meter must be made. There is an adjustment for this on the meter face.

To adjust the electrical zero, the front panel controls should be as follows:

Function:	Plus (+)
Range:	One volt (1v)
Meter	0.1 per cent (0.1%)
DIALAMATIC Switches:	All at zero (0)

The input cable should be plugged in and the clips shorted together. If the meter needle is reading off of zero, adjust R365.

OPEN CIRCUIT ZERO

The front panel controls remain the same for this adjustment as they were in the preceding one. Remove the input cable; this opens the input. If there is a meter deflection, adjust R329 for zero on the meter.

TEN VOLT RANGE CALIBRATION

The front panel controls should be set as follows:

Function:	Plus (+)
Range:	Ten volts (10v)
Meter:	0.1 per cent (0.1%)
DIALAMATIC Switches:	9.500

Clip the input cable to the D. C. Standard and adjust it for 9.5000 volts. The WAVETEK meter should read a null within specifications. If it does not, adjust R313 for a null.

RANGE BOARD

1 Volt Range:	Change the D. C. Standard's output to 0.95000 volts. Change the WAVETEK meter to the 1 volt range; adjust R114.
100 Volt Range:	Change the D. C. Standard's output to 95.000 volts. Change the WAVETEK meter to the 100 volt range; adjust R104.

1000 Volt Range:	Due to the accuracy of the range resistors, there need not be an adjustment for the 1000 volt range.

FULL SCALE ADJUST

The front panel controls should be set as follows:

Function:	Plus (+)
Range:	One volt (1v)
Meter:	0.1 per cent (0.1%)
DIALAMATIC Switches:	0000
Input Cable:	Shorted.

Turn the least significant decade (pot) on the DIALAMATIC switch to "10." The meter should read full scale. Adjust R111 for any minimum correction.

MODEL 202, A-C CONVERTER

EQUIPMENT REQUIRED

1. Voltmeter, 0.01% accuracy (WAVETEK Model 201 or equivalent).
2. D. C. Standard, Kintel Model 326 or equivalent.
3. Thermal Transfer Standard, Holt Model 6A or equivalent.
4. A-C Amplifier
5. Oscillator

} This combination must be capable of delivering from 0.95 volts — 950 volts at 100 Hz — 10 KHz. Optimation Model 104A or equivalent.

To calibrate the a-c converter, remove the two left side rails and swing the board out for easy access to the calibration controls.

BIAS ADJUSTMENT

This adjustment is used to set the static conditions of the output stage for optimum dynamic range. A test point consisting of a 1K resistor is provided at the collector of Q211. The static voltage at this collector should be approximately 5.5 volts. Adjust R231.

RANGE CALIBRATION

The 1000 volt range should be calibrated first because its high frequency adjustment is common to all ranges. To adjust the 1000 volt range, apply a signal of approximately 950 volts at 100 Hz to the input of the Model 202. Determine accurately the true RMS value of the calibration signal. Adjust the low frequency calibration control for the 1000 volt range to obtain the same reading on the Model 202. Change the frequency of the input signal to 10 KHz. Measure the true RMS value of the applied signal. Adjust the high frequency control (C214 and C215) for the 1000 volt range to obtain a similar reading on the Model 202.

The same procedure follows for the other three ranges with the exception of Input Signal Amplitude and the Calibration Controls. These three ranges can be adjusted in any order. All adjustment controls are identified on the converter shield.

SECTION V
PARTS LIST

GENERAL

This section contains the list of replaceable electronic parts and assemblies in the equipment; structural items and hardware such as screws and nuts are not included.

PARTS LIST ARRANGEMENT

The parts list starts with the Chassis and Front Panel assembly, Figure 5-1, followed by a list of components found on the Chassis as well as the major modular components.

LIST OF MANUFACTURERS

The MANUFACTURER (MFR) column of the parts list uses brief descriptions; the names are given in full below.

Allen Bradley	Allen Bradley, Milwaukee, Wisconsin
Amphenol	Amphenol Connector Division, Chicago, Illinois
ARCO	Arco Electronics, Great Neck, L.I., New York
Beckman	Beckman Systems Division, Fullerton, California
CDE	Cornell-Dubilier Electronics Division, Newark, New Jersey
Corning	Corning Glass Works, Corning, New York
CRL	Centralab, Division of Globe Union, Milwaukee, Wisconsin
CTS	Chicago Telephone, Pasadena, California
Elco	Elco Corporation, West Los Angeles, California
Eldema	Eldema Corporation, Compton, California
Erie	Erie Technological Products, Incorporated, Erie, Pennsylvania
Fairchild	Fairchild Semiconductor Corporation, Palo Alto, California
G. E.	General Electric Company, Semiconductor Division, Buffalo, New York
Good All	Good All Capacitor Division of TRW, Ogallala, Nebraska
IRC	International Resistance Company, Philadelphia, Pennsylvania

Littelfuse	Littelfuse Incorporated, Des Plaines, Illinois
Mallory	P. R. Mallory and Company, Indianapolis, Indiana
Mektron	California General Corporation Incorporated, Mektron Division, Chula Vista, California
Motorola	Motorola Semiconductor Products, Phoenix, Arizona
RCA	RCA, Semiconductor Division, Somerville, New Jersey
Richey	Richey Electronics Incorporated, Nashville, Tennessee
SEC	Sourthern Electronics Corporation, Burbank, California
Semtech	Semtech Corporation, Newbury Park, California
Sprague	Sprague Electric Company, North Adams, Massachusetts
Stackpole	Stackpole Carbon Company, Saint Mary's, Pennsylvania

MATCHED OR PAIRED PARTS

Prior to ordering or replacing electronic components in the equipment, re refer to the notes regarding matched or paired parts on the schematic diagrams in Section VI.

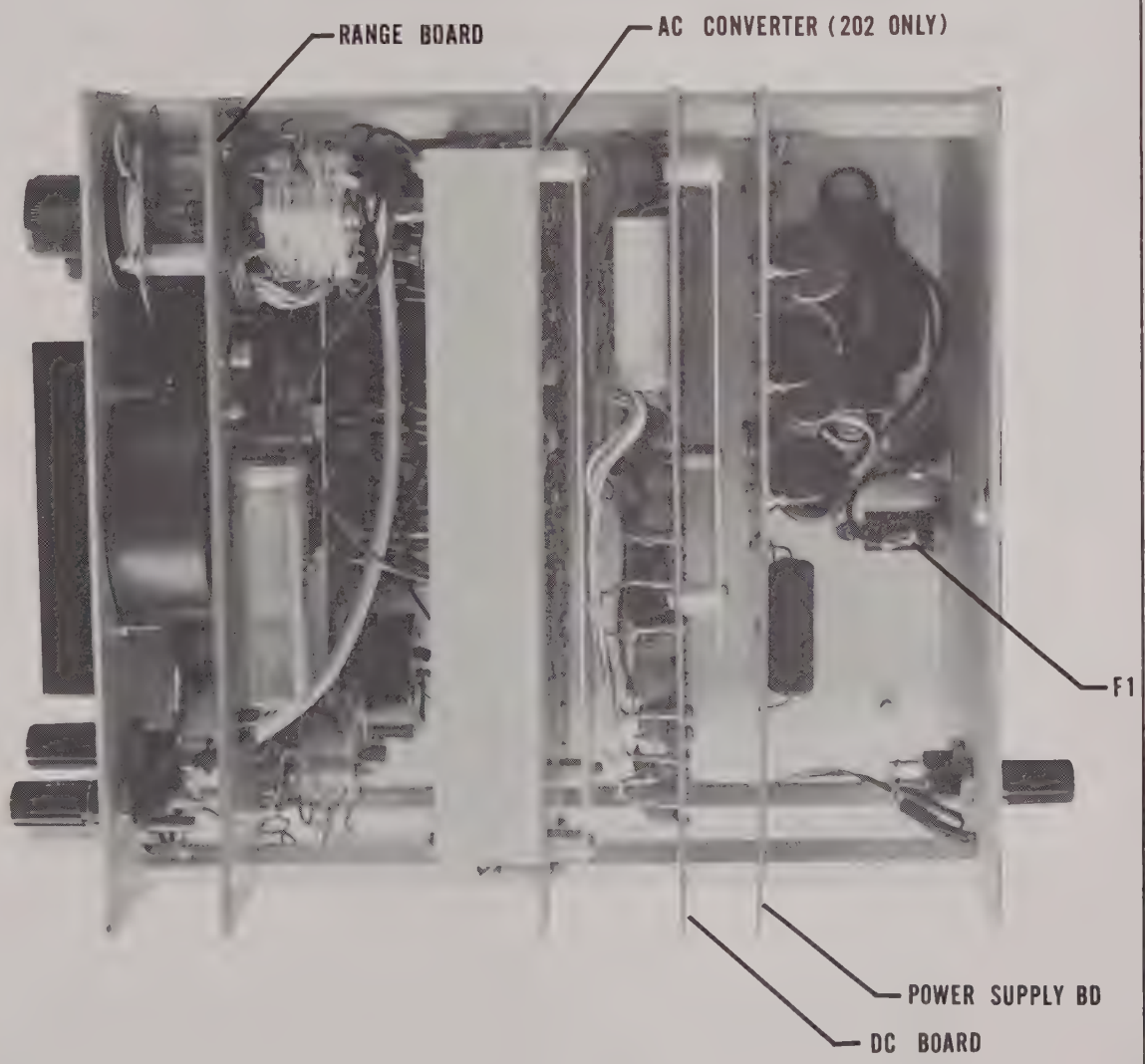


Figure 5-1.
Chassis Assembly

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R12 thru R22	MK-3	RESISTOR, Wire Wound, 1/4w, 0.025%, 200Ω	11	Mektron
R23	MK-3	RESISTOR, Wire Wound, 1/4w, 0.025%, 502Ω	1	Mektron
R1 thru R11	MK-3	RESISTOR, Wire Wound, 1/4w, 0.01%, 1000Ω	11	Mektron
R25 thru R35	C5	RESISTOR, Tin Oxide, 1/4w, 1%, 200Ω	11	Corning
R24		RESISTOR, Composition, 1/2w, Selected Value	1	
R109, R113	RC20GF472K	RESISTOR, Carbon, 1/2w, 10%, 4700Ω	2	Stackpole
C101	10TM-S10	CAPACITOR, Mylar-Paper, 1000v, 0.01 μf	1	Sprague
F1		FUSE, 1/2 amp, 3 AG	1	Littelfuse
	201-101B	AC/DC Range Board Assembly	1	Wavetek
	202-104C	AC Converter Assembly (Model 202 only)	1	Wavetek
	201-102C	DC Board Assembly	1	Wavetek
	201-103B	Power Supply Board Assembly	1	Wavetek

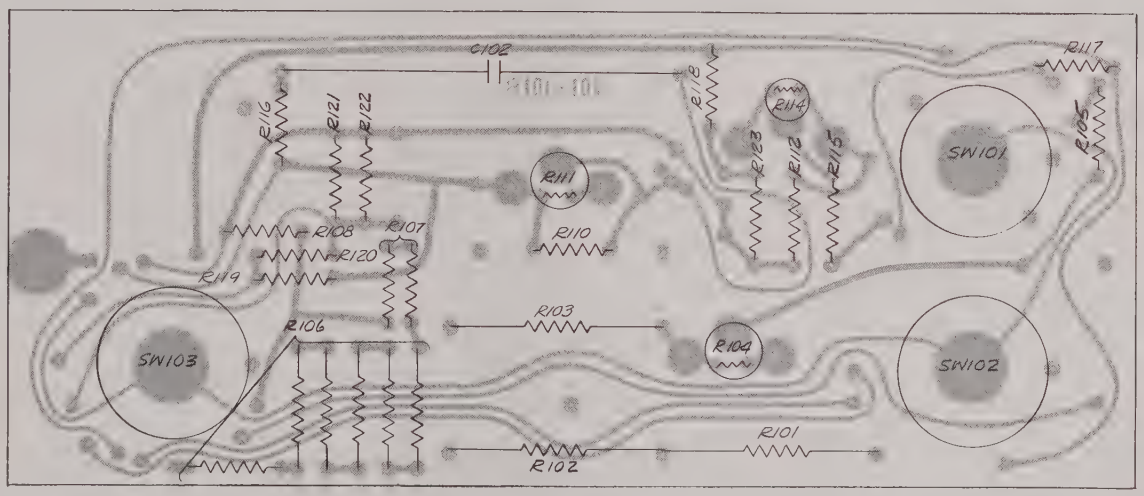


Figure 5-2.

Range Board Assembly

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R116	RC20GF220K	RESISTOR, Carbon, 1/2w, 10% 22Ω	1	Stackpole
R110	RC20GF392K	RESISTOR, Carbon, 1/2w, 10% 3900Ω	1	Stackpole
R121	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 10Ω	1	IRC
R120	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 49.9Ω	1	IRC
R119	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 499Ω	1	IRC
R117	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 2870Ω	1	IRC
R123	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 10,000Ω	1	IRC
R118	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 19,100Ω	1	IRC
R108	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 110,000Ω	1	IRC
R107	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 422,000Ω	1	IRC
R106	RN65D	RESISTOR, Metal Film, 1/2w, 1% 1,500,000Ω	1	IRC
R122	RN60D	RESISTOR, Metal Film, 1/4w, 1% 12.4Ω	1	IRC
R112	MK-3	RESISTOR, Wire Wound, 1/4w, 0.01% 1111.1Ω	1	Mektron
R115	MK-3	RESISTOR, Wire Wound, 1/4w, 0.025% 8995Ω	1	Mektron
R105	MK-3	RESISTOR, Wire Wound, 1/4w, 0.025% 100,050Ω	1	Mektron
R101, R102, R103	MK-5-1	RESISTOR, Wire Wound, 1w, 0.025% 3,300,000Ω	3	Mektron
R114	62PR10	POTENTIOMETER, 10Ω	1	Beckman

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R104, R111	FR103M	POTENTIOMETER, 10,000Ω	2	Allen-Bradley
C102	34-750-1750-6T	CAPACITOR, Electrolytic, 6v, 1750 μf	1	Richey
SW101*		SWITCH, 2 Pole, 3 position	1	Wavetek
SW101**		SWITCH, 8 Pole, 4 position	1	Wavetek
SW102		SWITCH, 6 Pole, 4 position	1	Wavetek
SW103		SWITCH, 6 Pole, 4 position	1	Wavetek

* Model 201 only.

** Model 202 only.

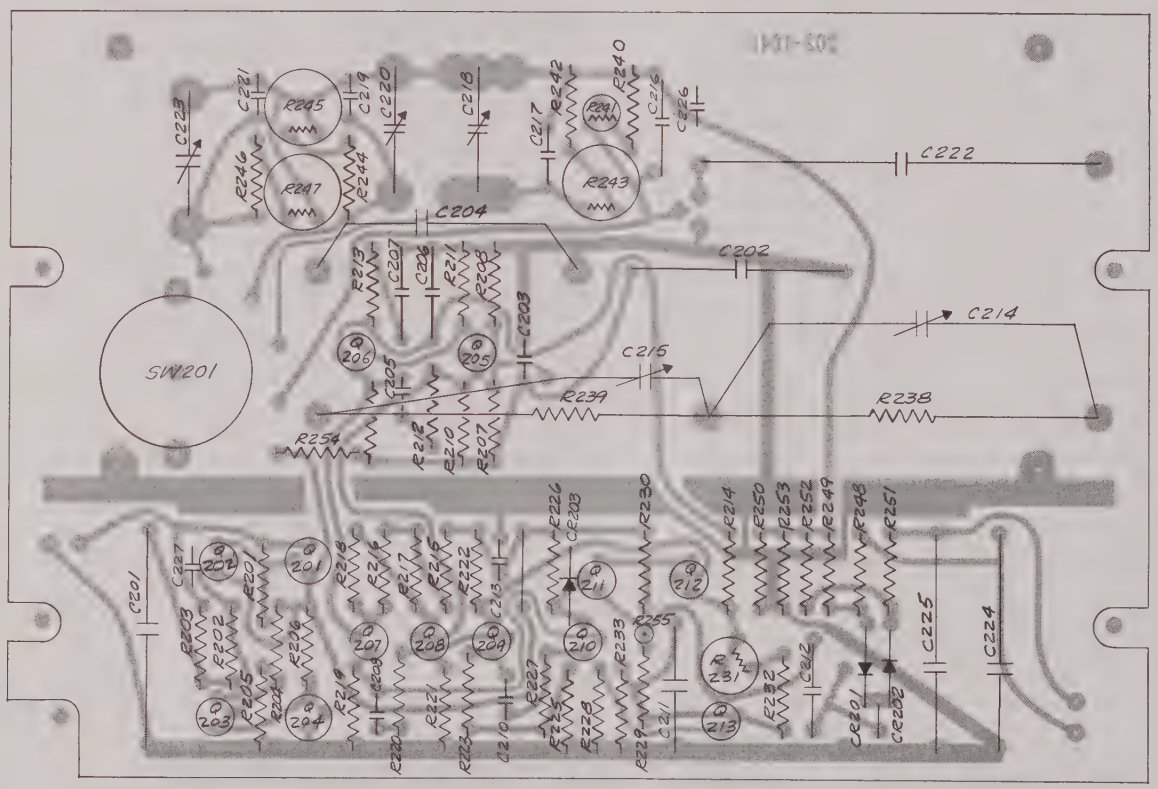


Figure 5-3.
AC Converter Assembly
(Model 202 only)

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R254	RC20GF100K	RESISTOR, Carbon, 1/2w, 10% 10Ω	1	Stackpole
R218	RC20GF150K	RESISTOR, Carbon, 1/2w, 10% 15Ω	1	Stackpole
R216, R217, R223, R227	RC20GF470K	RESISTOR, Carbon, 1/2w, 10% 47Ω	4	Stackpole
R228	RC20GF101K	RESISTOR, Carbon, 1/2w, 10% 100Ω	1	Stackpole
R220	RC20GF121K	RESISTOR, Carbon, 1/2w, 10% 120Ω	1	Stackpole
R225	RC20GF221K	RESISTOR, Carbon, 1/2w, 10% 220Ω	1	Stackpole
R212, R215	RC20GF271K	RESISTOR, Carbon, 1/2w, 10% 270Ω	2	Stackpole
R209, R210, R232	RC20GF471K	RESISTOR, Carbon, 1/2w, 10% 470Ω	3	Stackpole
R233	RC20GF561K	RESISTOR, Carbon, 1/2w, 10% 560Ω	1	Stackpole
R219, R221, R222, R226, R255	RC20GF102K	RESISTOR, Carbon, 1/2w, 10% 1000Ω	5	Stackpole
R211	RC20GF911J	RESISTOR, Carbon, 1/2w, 5% 910Ω	1	Stackpole
R204	RC20GF332K	RESISTOR, Carbon, 1/2w, 10% 3300Ω	1	Stackpole
R205, R206	RC20GF472K	RESISTOR, Carbon, 1/2w, 10% 4700Ω	2	Stackpole
R201	RC20GF103K	RESISTOR, Carbon, 1/2w, 10% 10,000Ω	1	Stackpole
R202, R203	RC20GF273K	RESISTOR, Carbon, 1/2w, 10% 27,000Ω	2	Stackpole
R229	RC20GF473K	RESISTOR, Carbon, 1/2w, 10% 47,000Ω	1	Stackpole
R213	RC20GF104K	RESISTOR, Carbon, 1/2w, 10% 100,000Ω	1	Stackpole

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R214	RC20GF155K	RESISTOR, Carbon, 1/2w, 10% 1,500,000Ω	1	Stackpole
R207, R208	RC20GF275K	RESISTOR, Carbon, 1/2w, 10% 2,700,000Ω	2	Stackpole
R230		RESISTOR, Carbon, 1/2w, 10%, Trim	1	Stackpole
R250	MEA T-2	RESISTOR, Metal Film, 1/4w, 1% 100Ω	1	IRC
R240	MEA T-2	RESISTOR, Metal Film, 1/4w, 1% 110Ω	1	IRC
R249, R252	MEA T-2	RESISTOR, Metal Film, 1/4w, 1% 499Ω	2	IRC
R253	MEA T-0	RESISTOR, Metal Film, 1/4w, 1% 1500Ω	1	IRC
R242	MEA T-2	RESISTOR, Metal Film, 1/4w, 1% 1910Ω	1	IRC
R244	MEA T-2	RESISTOR, Metal Film, 1/4w, 1% 20,000Ω	1	IRC
R248, R251	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 48,700Ω	2	IRC
R246	MEA T-2	RESISTOR, Metal Film, 1/4w, 1% 200,000Ω	1	IRC
R238, R239	MEH T-2	RESISTOR, Metal Film, 2w, 1% 500,000Ω	2	IRC
R241	62PR10	POTENTIOMETER, 10Ω	1	Beckman
R243	FR101M	POTENTIOMETER, 100Ω	1	Allen-Bradley
R245	FR102M	POTENTIOMETER, 1000Ω	1	Allen-Bradley
R231	FR252M	POTENTIOMETER, 2500Ω	1	Allen-Bradley
R247	FR103M	POTENTIOMETER, 10,000Ω	1	Allen-Bradley

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
C223	822EZ	CAPACITOR, Variable, 1.5 - 7 pf	1	CRL
C220	423	CAPACITOR, Variable, 7 - 100 pf	1	Arco
C214, C215	565-013	CAPACITOR, Variable, 8 - 12 pf	2	Erie
C218	469	CAPACITOR, Variable, 170 - 780 pf	1	Arco
C221	DM-15-100J	CAPACITOR, Silver Mica, 5% 10 pf	1	Arco
C210	DD470	CAPACITOR, Ceramic, 1000v, 10% 47 pf	1	CRL
C219	DM-15-151F	CAPACITOR, Silver Mica, 1% 150 pf	1	Arco
C208	DD152	CAPACITOR, Ceramic, 1000v, 10% 1500 pf	1	CRL
C217	DM-15-152F	CAPACITOR, Silver Mica, 1% 1500 pf	1	Arco
C227	DD391	CAPACITOR, Ceramic, 1000v, 10% 390 pf	1	CRL
C211	192P22392	CAPACITOR, Mylar, 200v, 10% 0.022 µf	1	Sprague
C210	PVC1147	CAPACITOR, Mylar, 100v, 10% 0.047 µf	1	Mallory
C203, C213	HY320	CAPACITOR, Ceramic, 10v, 0.1 µf	2	Sprague
C222	MO504-L1	CAPACITOR, Mylar, 1000v, 0.5 µf	1	SEC
C204, C224, C225	X663F	CAPACITOR, Mylar, 200v, 10% 2 µf	3	Good-All
C206	150D	CAPACITOR, Tantalum, 35v, 5.6 µf	1	Sprague
C207	150D	CAPACITOR, Tantalum, 20v, 10 µf	1	Sprague

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
C212	150D	CAPACITOR, Tantalum, 10v, 33 μf	1	Sprague
C201, C202	EA15-250	CAPACITOR, Electrolytic, 15v, 250 μf	2	CRL
C205	DD221	CAPACITOR, Ceramic, 1000v, 10% 220 pf	1	CRL
CR201, CR202, CR203	1N4009	DIODES	3	G. E.
Q209, Q210, Q213	2N3563	TRANSISTORS	3	Fairchild
Q202, Q203	2N3565	TRANSISTORS	2	Fairchild
Q201, Q204	2N3638	TRANSISTORS	2	Fairchild
Q205, Q206	2N3819	TRANSISTORS, Matched Pair	2	Motorola
Q207, Q208, Q211, Q212	2N3905	TRANSISTORS	4	Motorola
SW201	T106	WAFER, 2 pole, 5 position	1	CTS

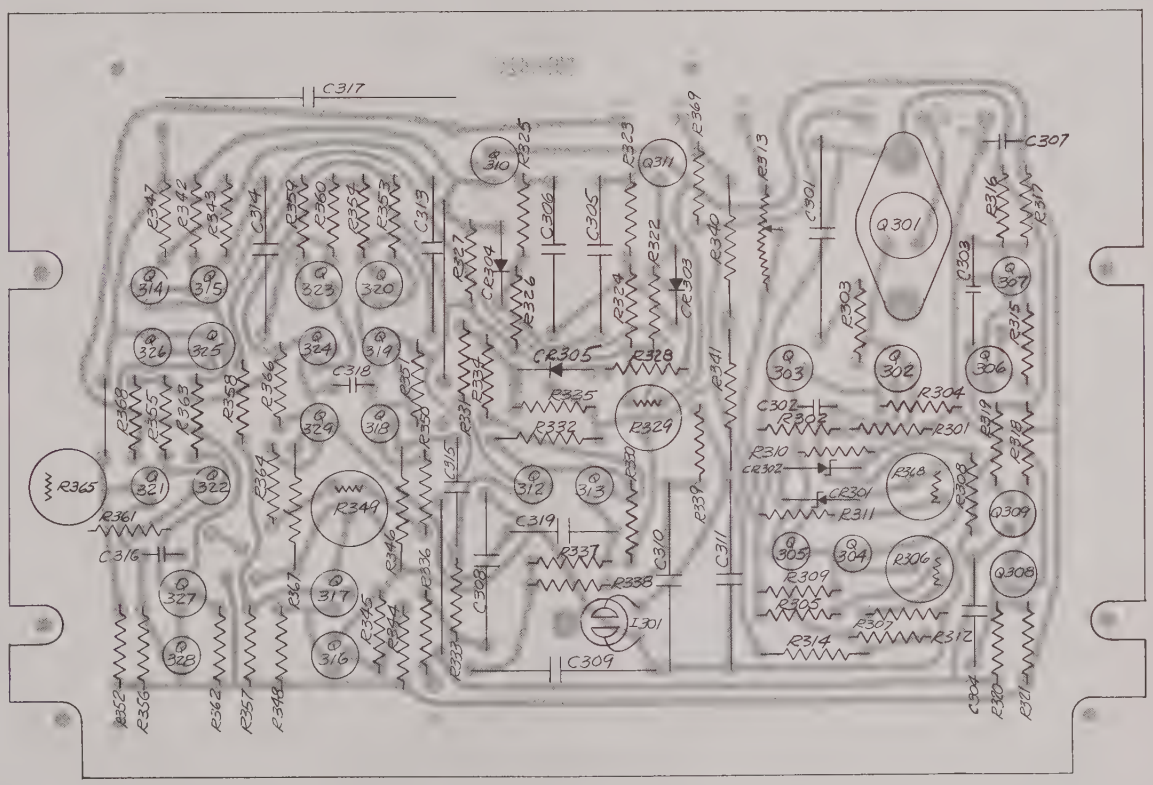


Figure 5-4.

DC Board Assembly

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R353, R359	RC20GF470K	RESISTOR, Carbon, 1/2w, 10% 47Ω	2	Stackpole
R319	RC20GF471K	RESISTOR, Carbon, 1/2w, 10% 470Ω	1	Stackpole
R303	RC20GF821K	RESISTOR, Carbon, 1/2w, 10% 820Ω	1	Stackpole
R355	RC20GF182K	RESISTOR, Carbon, 1/2w, 10% 1800Ω	1	Stackpole
R344, R345, R356, R357, R358	RC20GF222K	RESISTOR, Carbon, 1/2w, 10% 2200Ω	5	Stackpole
R362	RC20GF272K	RESISTOR, Carbon, 1/2w, 10% 2700Ω	1	Stackpole
R331, R334, R315 R368	RC20GF392K	RESISTOR, Carbon, 1/2w, 10% 3900Ω	4	Stackpole
R318, R322, R327, R330, R342, R354, R360	RC20GF472K	RESISTOR, Carbon, 1/2w, 10% 4700Ω	7	Stackpole
R309	RC20GF682K	RESISTOR, Carbon, 1/2w, 10% 6800Ω	1	Stackpole
R324, R326, R335, R363	RC20GF103K	RESISTOR, Carbon, 1/2w, 10% 10,000Ω	4	Stackpole
R304, R328	RC20GF153K	RESISTOR, Carbon, 1/2w, 10% 15,000Ω	2	Stackpole
R343, R347	RC20GF223K	RESISTOR, Carbon, 1/2w, 10% 22,000Ω	2	Stackpole
R308, R310	RC20GF273K	RESISTOR, Carbon, 1/2w, 10% 27,000Ω	2	Stackpole
R323, R325	RC20GF473K	RESISTOR, Carbon, 1/2w, 10% 47,000Ω	2	Stackpole
R348	RC20GF563K	RESISTOR, Carbon, 1/2w, 10% 56,000Ω	1	Stackpole
R302	RC20GF104K	RESISTOR, Carbon, 1/2w, 10% 100,000Ω	1	Stackpole

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R338, R339	RC20GF274K	RESISTOR, Carbon, 1/2w, 10% 270,000Ω	2	Stackpole
R361	RC20GF474K	RESISTOR, Carbon, 1/2w, 10% 470,000Ω	1	Stackpole
R336	RC20GF824K	RESISTOR, Carbon, 1/2w, 10% 820,000Ω	1	Stackpole
R301, R352	RC20GF105K	RESISTOR, Carbon, 1/2w, 10% 1,000,000Ω	2	Stackpole
R369	RC20GF395K	RESISTOR, Carbon, 1/2w, 10% 3,900,000Ω	1	Stackpole
R340, R341	RC42GF154J	RESISTOR, Carbon, 2w, 5% 150,000Ω	2	Stackpole
R332	BWH20	RESISTOR, Wirewound, 1w, 5% 0.27Ω	1	IRC
R305	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 3160Ω	1	IRC
R317, R350, R364	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 4640Ω	3	IRC
R320	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 5760Ω	1	IRC
R321	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 6980Ω	1	IRC
R307	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 12,100Ω	1	IRC
R316	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 15,000Ω	1	IRC
R333, R337, R351, R366	CEA T-0	RESISTOR, Metal Film, 1/4w, 1% 464,000Ω	4	IRC
R346, R367	RN65D	RESISTOR, Metal Film, 1/2w, 1% 1,500,000Ω	2	IRC
R313	78PR20	POTENTIOMETER, 20Ω	1	Beckman
R368	FR101M	POTENTIOMETER, 100Ω	1	Allen-Bradley

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R306, R349	FR252M	POTENTIOMETER, 2500Ω	2	Allen-Bradley
R329, R365	FR103M	POTENTIOMETER, 10,000Ω	2	Allen-Bradley
R311, R312	CEA T-2	RESISTOR, TRIM, Metal Film, 1/4w, 1%, Selected Value	2	IRC
R314	MK-3	RESISTOR, TRIM, Wire Wound, 0.1%, Selected Value	1	Mektron
C318	DD101	CAPACITOR, Ceramic, 100 pf	1	CRL
C319	CK103	CAPACITOR, Ceramic, 0.01 μf	1	CRL
C303, C304, C315, C319	WMF1S1	CAPACITOR, Mylar, 0.01 μf	4	CDE
C307, C316	HY320	CAPACITOR, Ceramic, 0.1 μf	2	Sprague
C305, C306, C308, C313, C314	WMF1P1	CAPACITOR, Mylar, 100v, 0.1 μf	5	CDE
C309, C310, C311	POLO4-L1	CAPACITOR, Polystyrene, 200v, 0.1 μf	3	SEC
C301	WMF1P33	CAPACITOR, Mylar, 100v, 0.33 μf	1	CDE
C317	X663F	CAPACITOR, Mylar, 200v, 4 μf	1	Good-All
CR301, CR302		DIODE, Zener, Matched Pair	1	
CR303, CR304, CR305	1N4009	DIODE	3	G. E.
Q304, Q305, Q307, Q321, Q322, Q326, Q328	2N3565	TRANSISTOR	7	Fairchild
Q306	2N3567	TRANSISTOR	1	Fairchild

CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
Q302, Q303, Q308, Q309, Q310, Q311, Q316, Q317, Q320, Q323, Q325, Q327	2N3638	TRANSISTOR	12	Fairchild
Q315, Q319, Q324	2N4250	TRANSISTOR	3	Fairchild
Q314	MPS6521	TRANSISTOR	1	Motorola
Q301	40250	TRANSISTOR	1	RCA
Q318, Q329	2N4250	TRANSISTOR, Matched Pair	1	Fairchild
Q312, Q313	MPS6521	TRANSISTOR, Matched Pair	1	Motorola
I301	NE2P	INDICATOR LAMP, Neon	1	Eldema

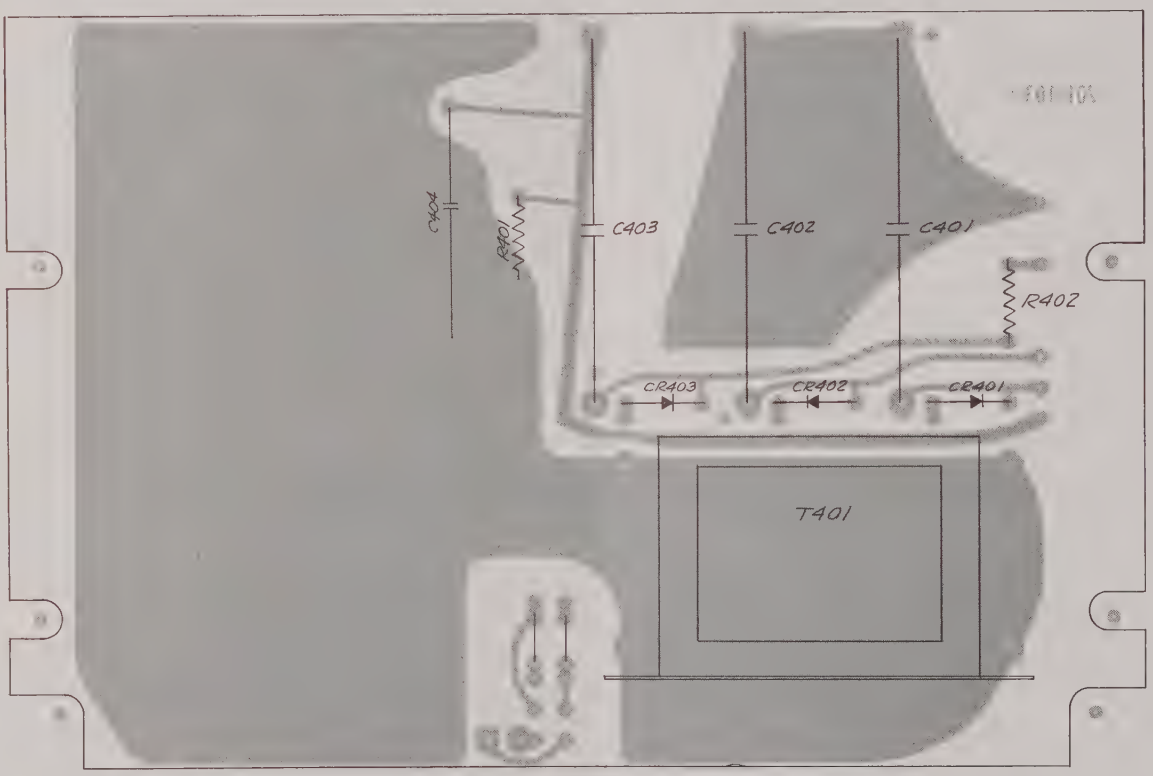


Figure 5-5.

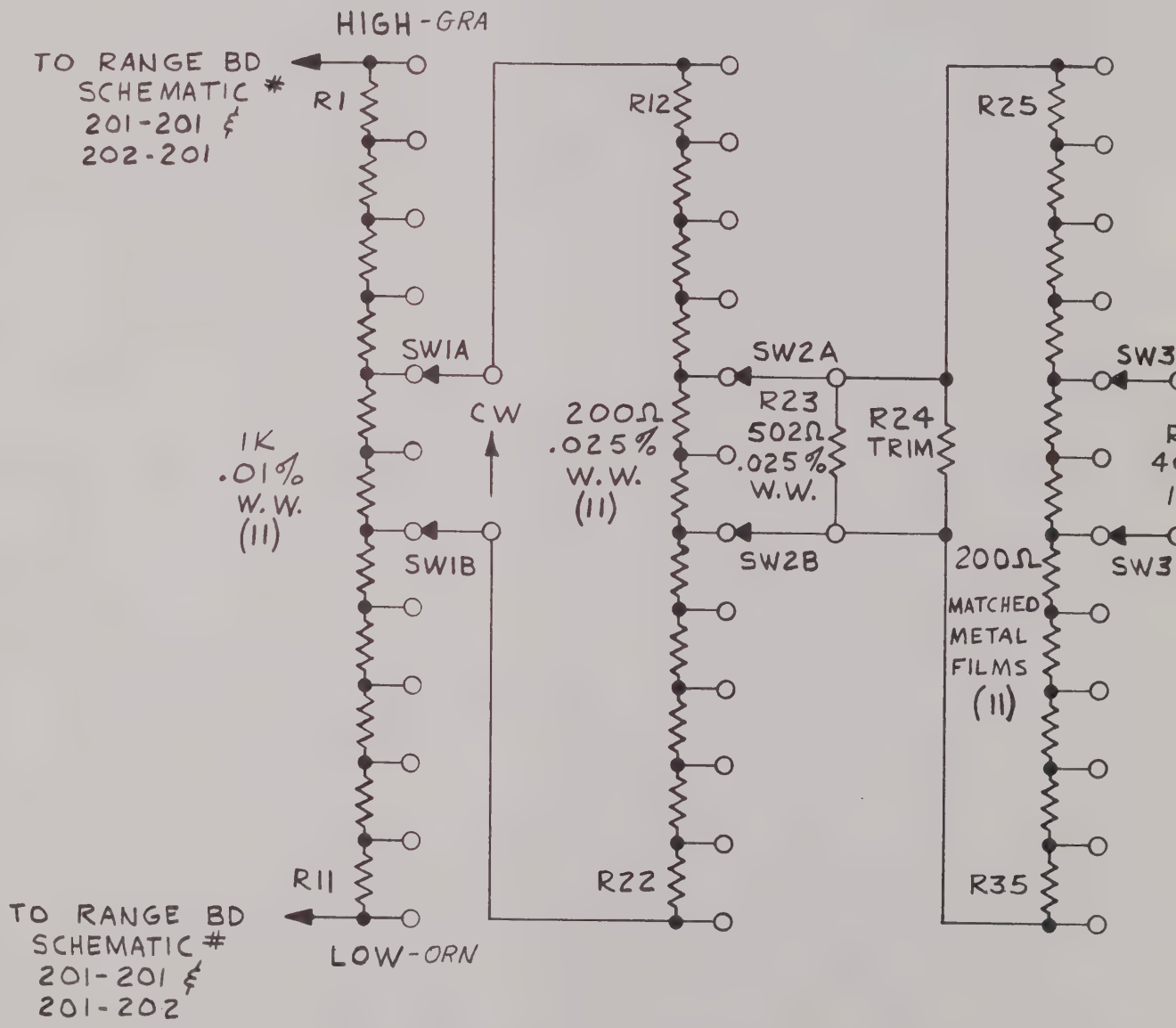
Power Supply Board Assembly

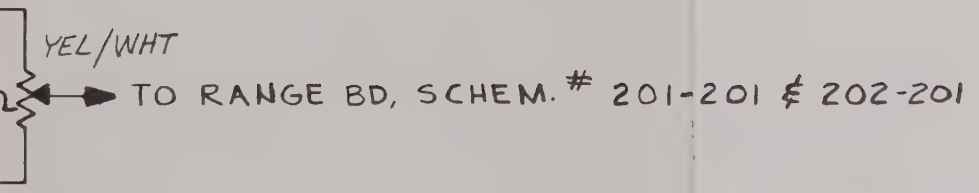
CIRCUIT REFERENCE	PART NO.	DESCRIPTION	QTY	MFR
R402**	RC20GF470K	RESISTOR, Carbon, 1/2w, 10%, 47Ω	1	Stackpole
R401**	RC20GF106K	RESISTOR, Carbon, 1/2w, 10%, 10,000,000Ω	1	Stackpole
C404**	10TM-S10	CAPACITOR, Mylar-Paper, 1000v, 0.01 μf	1	Sprague
C401**, C402**, C403**	34-750-1000-25T	CAPACITOR, Electrolytic, 1000 μf	3	Richey
C401*, C402*	34-750-1000-25T	CAPACITOR, Electrolytic, 1000 μf	2	Richey
CR401**, CR402**, CR403**	SCE-1	DIODE	3	Semtech
CR401*, CR402*	SCE-1	DIODE	2	Semtek
T401	50810	TRANSFORMER	1	Wavetek

* Model 201 Only.

** Model 202 Only.

SECTION VI
SCHEMATIC DIAGRAMS


HIGH - GRA
TO RANGE BD SCHEMATIC # 201-201 & 202-201
R1
R12
R25
SW1A
SW2A
SW3
CW
1K .01% W.W. (11)
200Ω .025% W.W. (11)
R23 502Ω .025% W.W.
R24 TRIM
SW1B
SW2B
SW3
200Ω MATCHED METAL FILMS (11)
R11
R22
R35
TO RANGE BD SCHEMATIC # 201-201 & 201-202
LOW - ORN



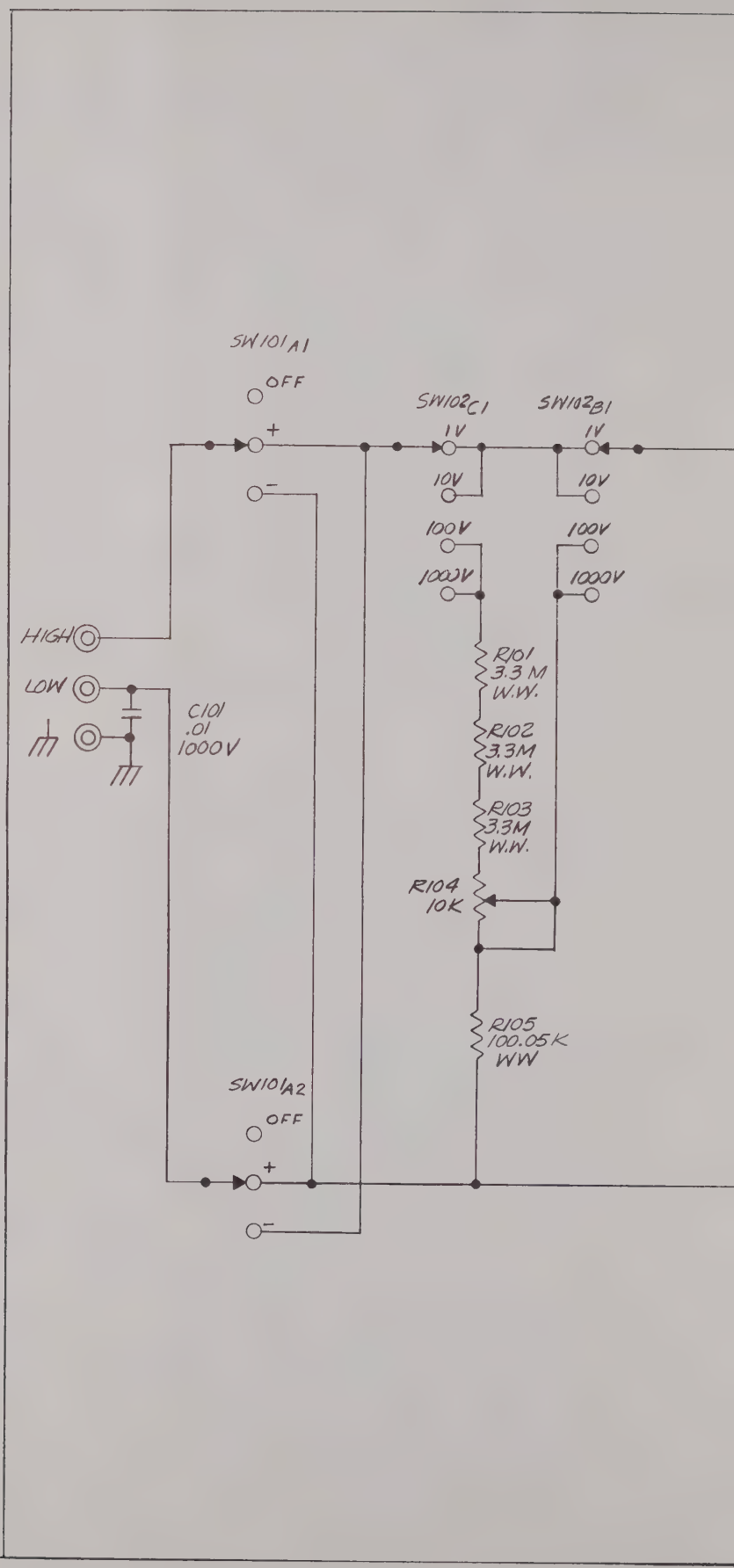
A		S.L.B.	10-31-66	
CHG	ECN NO.	BY	DATE	APP.

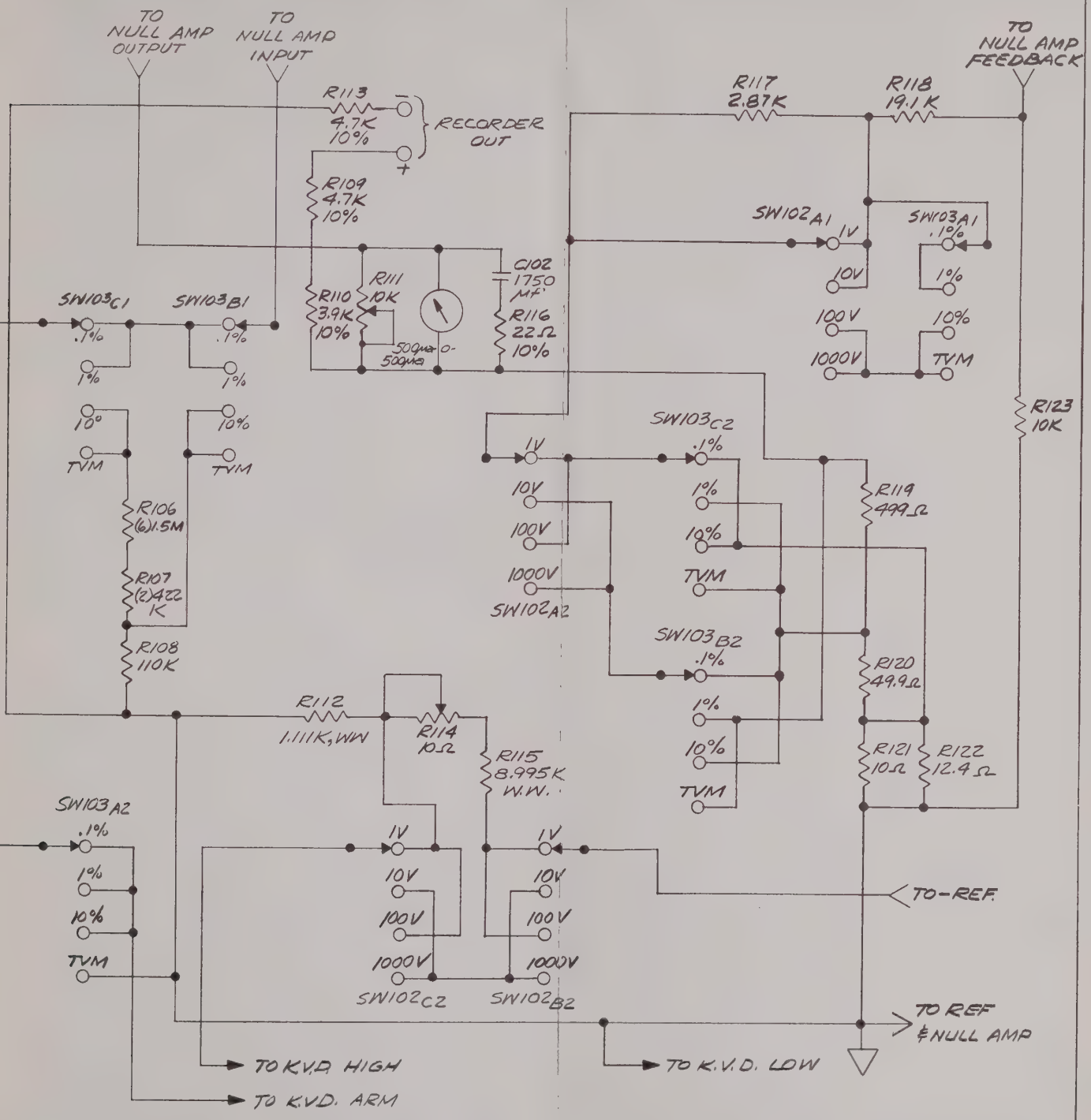
WAVETEK 8159 ENGINEER RD SAN DIEGO, CALIF

DWN: DATE: 9-15-66 APPD

KELVIN-VARLEY DIVIDER

MODEL: 201 & 202 | 200-200


SW101 A1
OFF
+
−
SW102 C1
SW102 B1
1V
10V
100V
1000V
HIGH
LOW
C101
.01
1000V
R101
3.3 M
W.W.
R102
3.3M
W.W.
R103
3.3M
W.W.
R104
10K
R105
100.05K
WW
SW101 A2
OFF
+
−



B	ECN 85	W	11-21-66
A	ECN 67	W	11-2-66

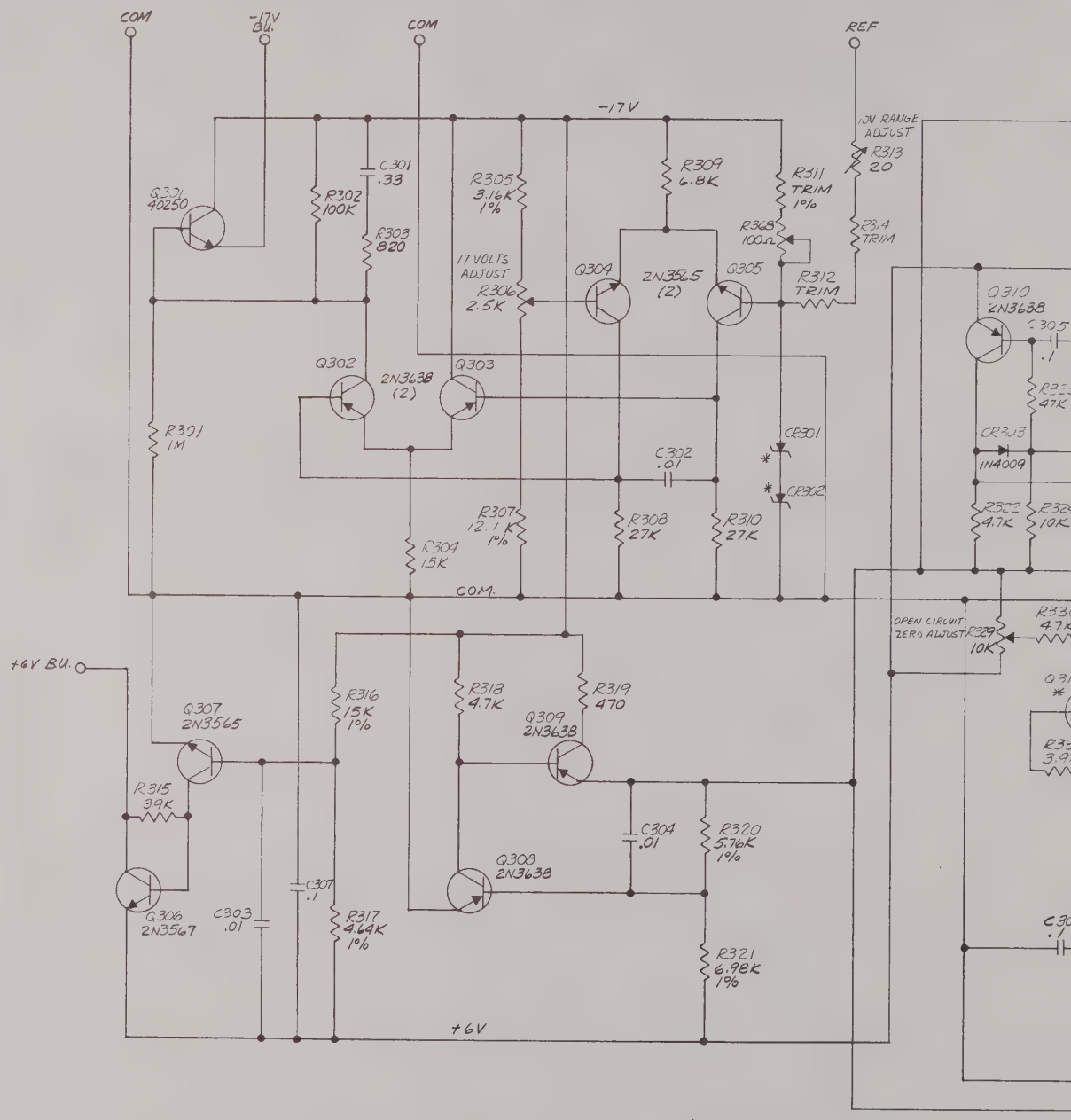
WAVETEK 8159 ENGINEERRD SAN DIEGO, CALIF

DWN: WHITELOCK DATE: 9-16-6 APPD:

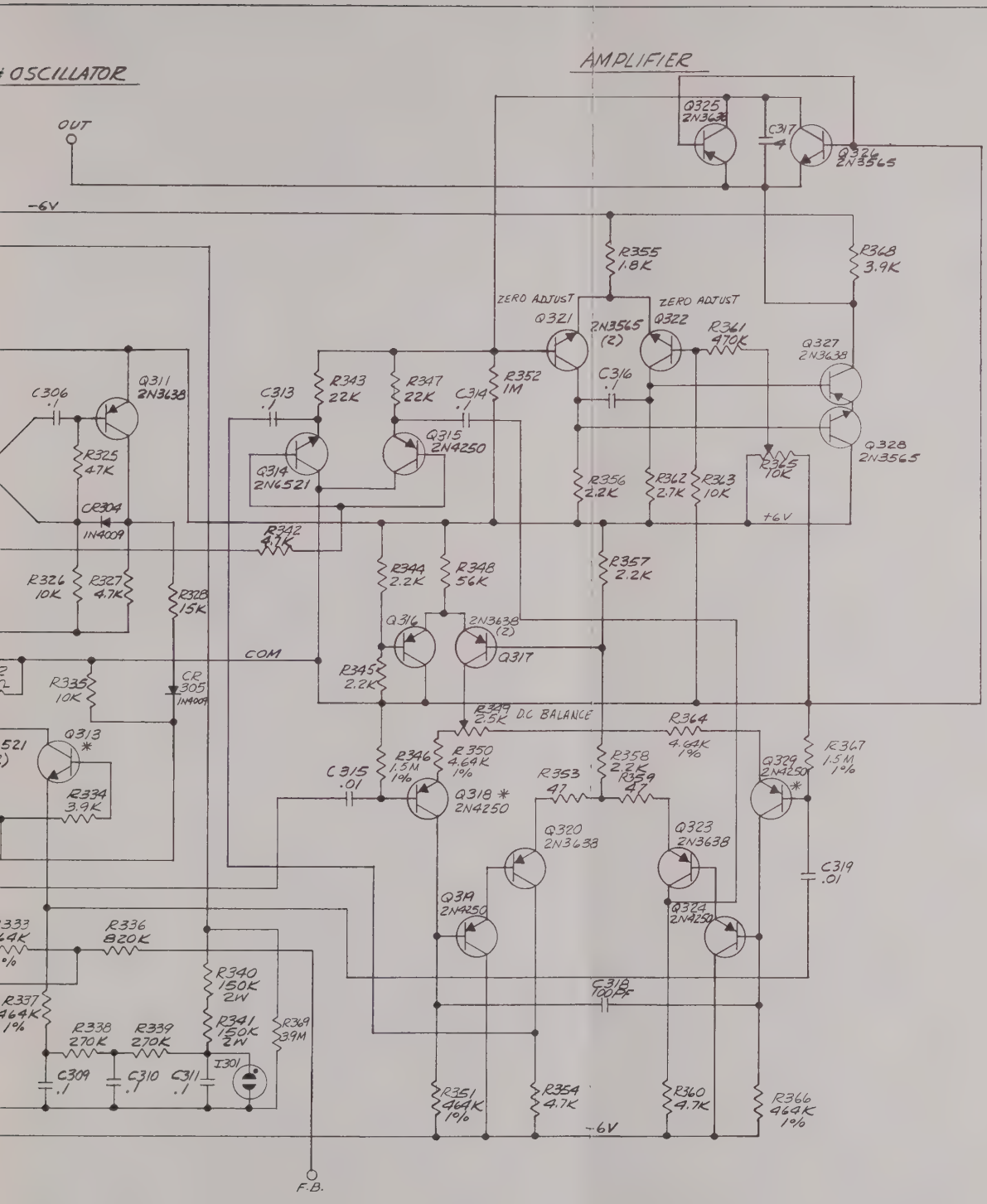
SCHEMATIC - DC RANGE BD.

MODEL: 201 NO: 201-201

REFERENCE & REGULATOR



NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IN OHMS
2. CAPACITANCE IN MICROFARADS
3. (*) INDICATES MATCHED PAIR.



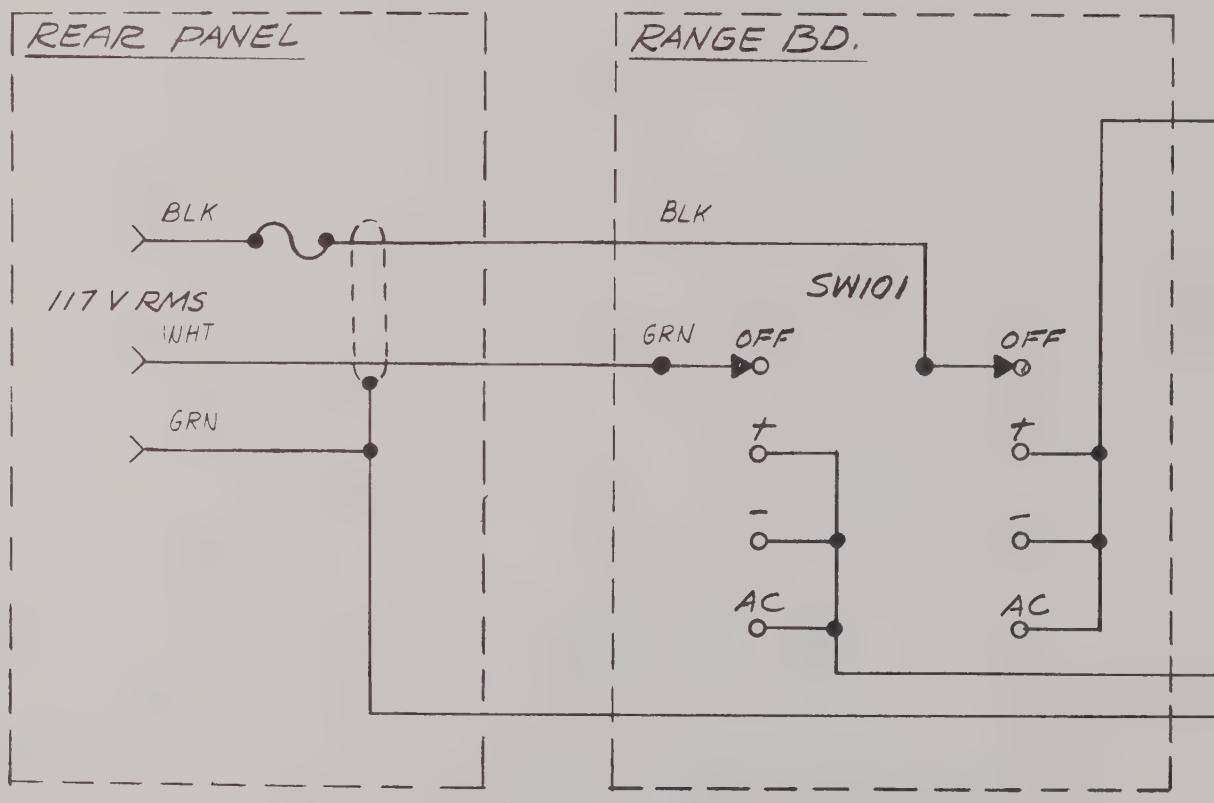
A			SLB.	10/31/66
CHG	ECN. NUMBER		BY	DATE APP

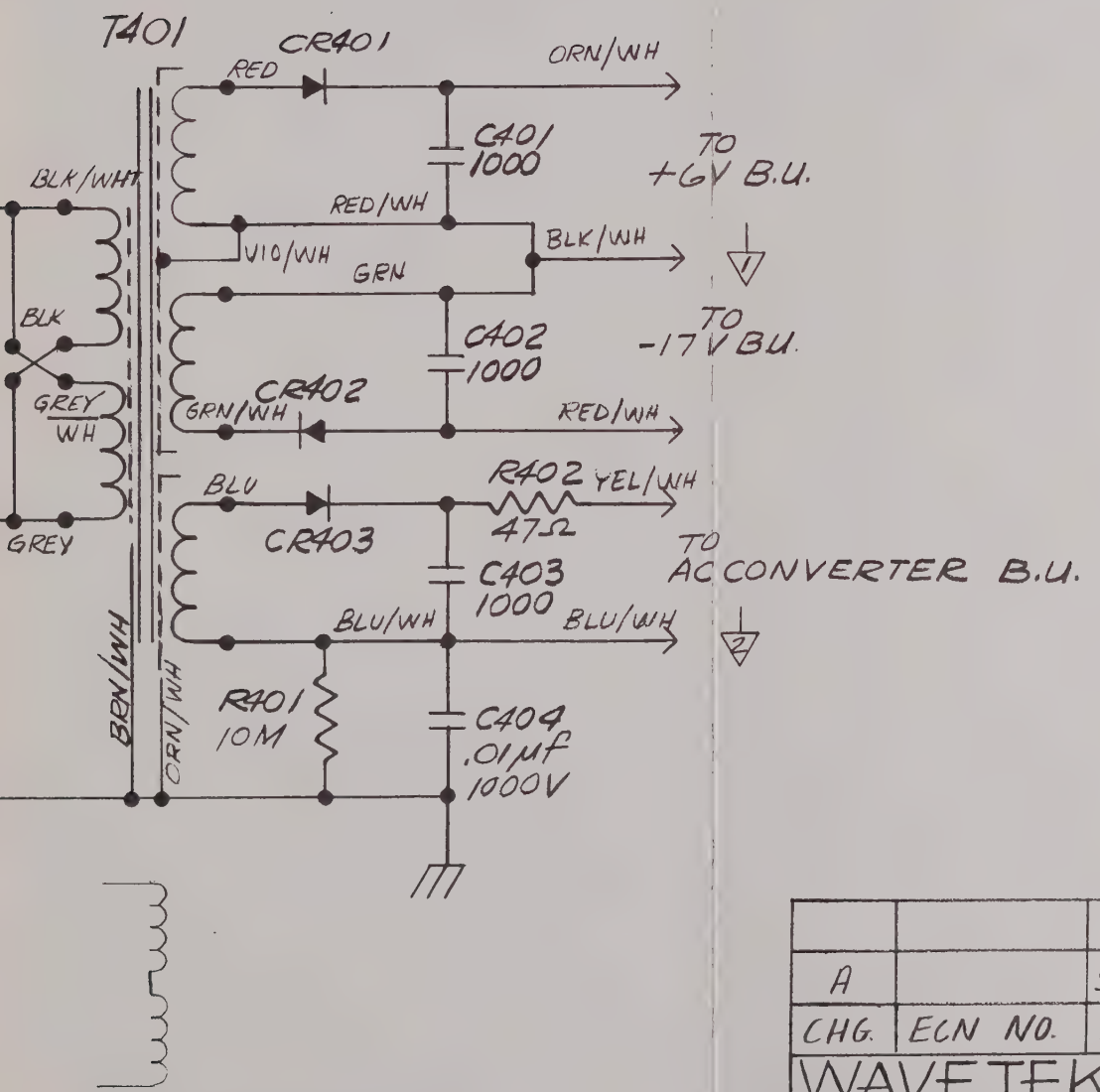
WAVETEK 8159 ENG NEER RD SAN DIEGO, CALIF

DWN: DATE: ADDD.:

SCHEMATIC - DC BOARD

MODEL: 201 NO: 201-202


REAR PANEL
RANGE BD.
BLK
BLK
SW101
117 V RMS
WHT
GRN
OFF
OFF
GRN
+
-
AC
+
-
AC



220V PRIMARY WIRING

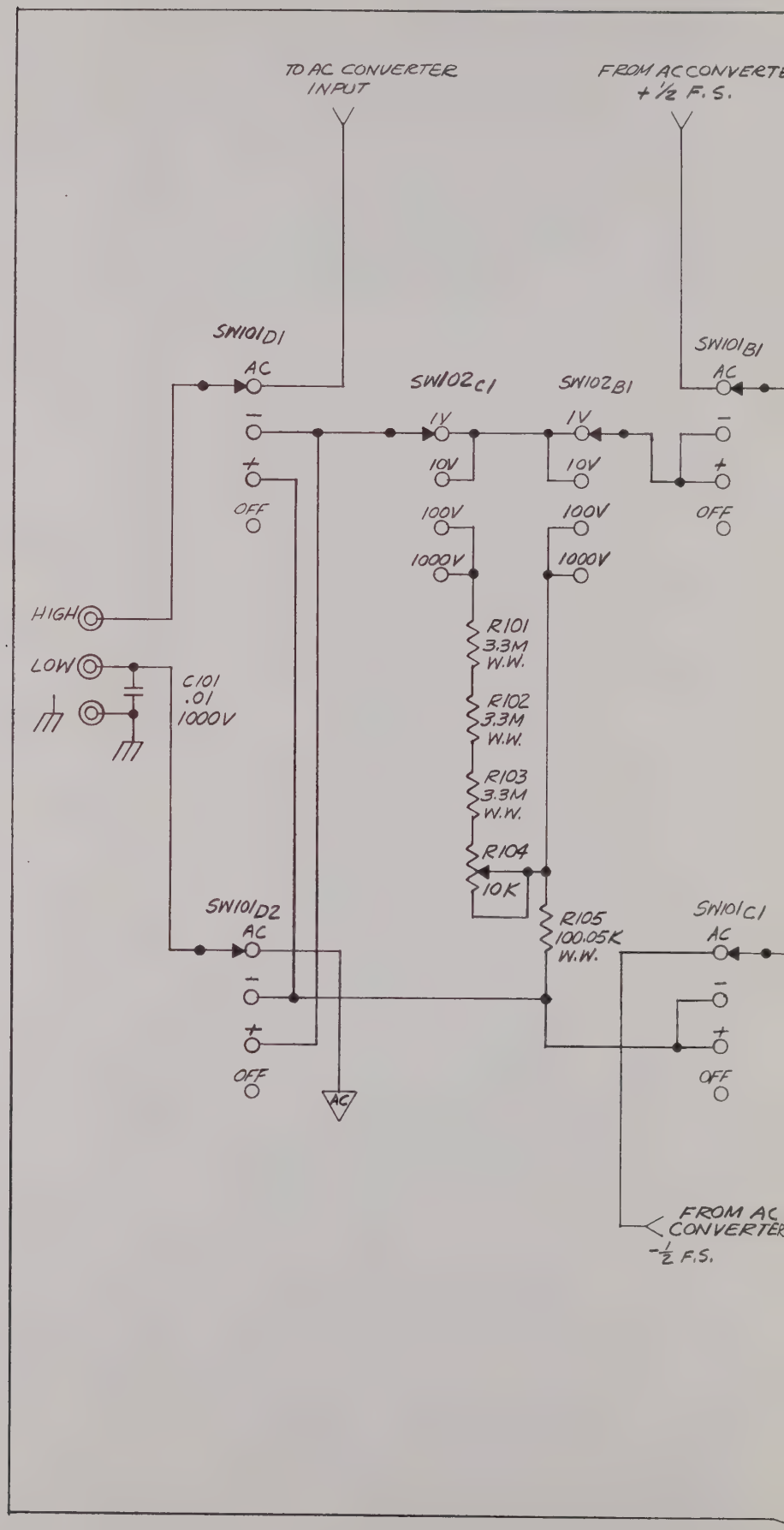
A		SLB	10-31-66	
CHG.	ECN NO.	BY	DATE	APP

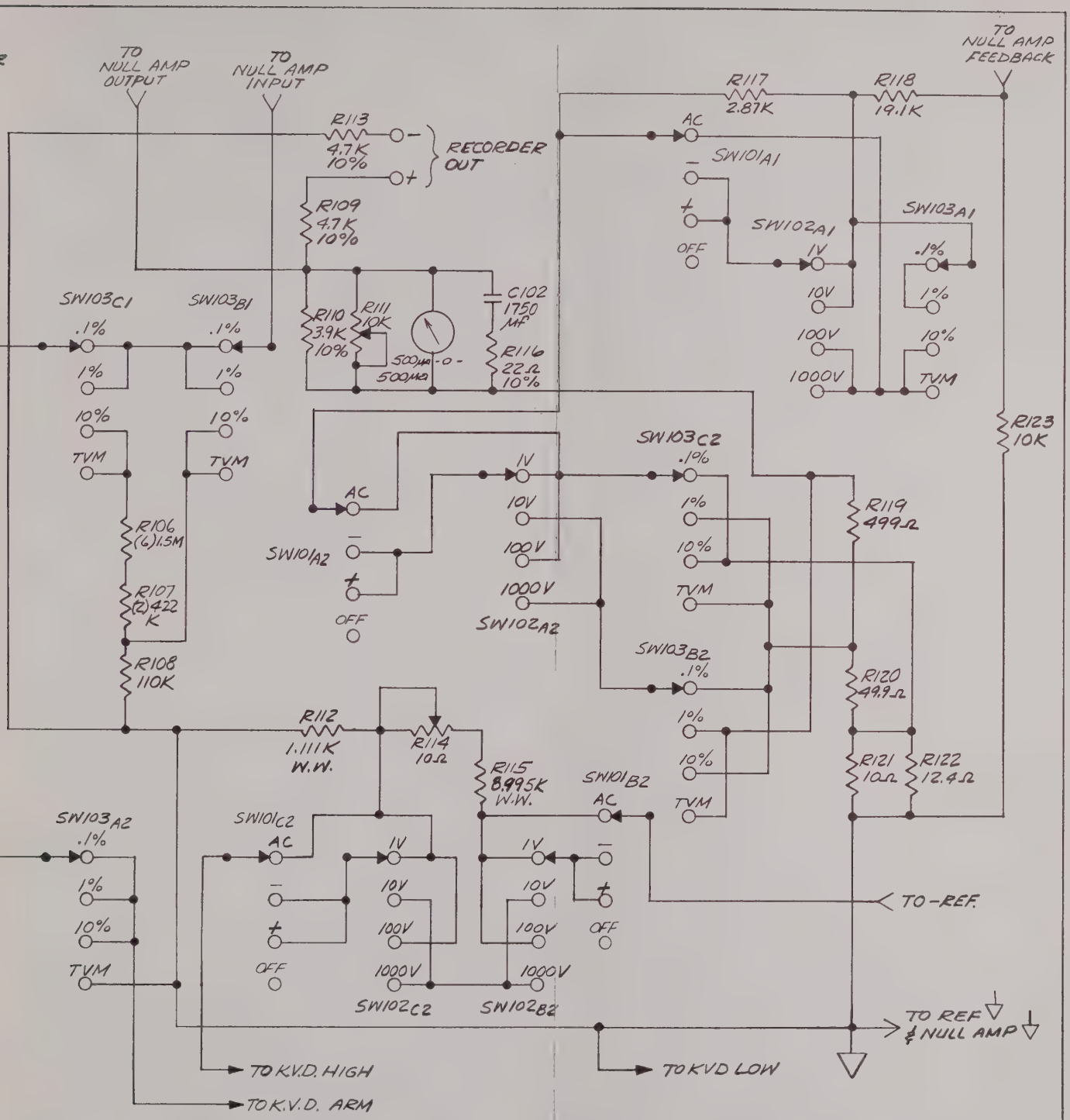
WAVETEK 8159 ENGINEER RD SAN DIEGO, CALIF.

DWN: WHITELOCK DATE: 9-13-6 APP'D:

SCHEMATIC - POWER SUPPLY BD.

MODEL: 201, 202 NO: 201-203


TO AC CONVERTER INPUT
FROM AC CONVERTER +½ F.S.
SW101D1
AC
SW102C1
SW102B1
SW101B1
AC
1V
10V
100V
1000V
OFF
HIGH
LOW
C101 .01 1000V
R101 3.3M W.W.
R102 3.3M W.W.
R103 3.3M W.W.
R104 10K
R105 100.05K W.W.
SW101D2
AC
SW101C1
AC
AC
FROM AC CONVERTER -½ F.S.



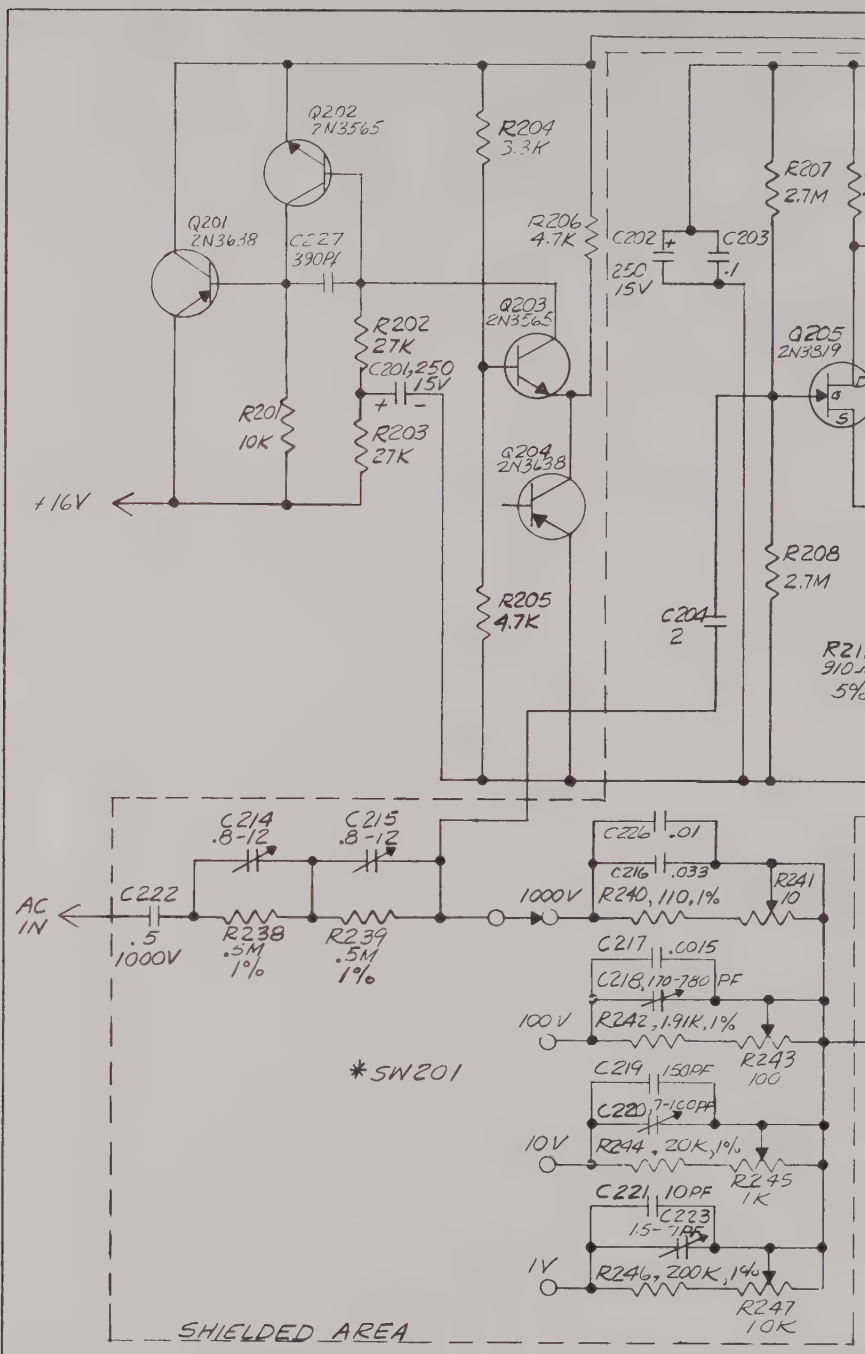
B	85	JW	11-21-66	10.
A	67	SLB	10-31-66	
CHG.	ECN. NO.	BY	DATE	APP

WAVETEK 8159 ENGINEER RD SAN DIEGO, CALIF

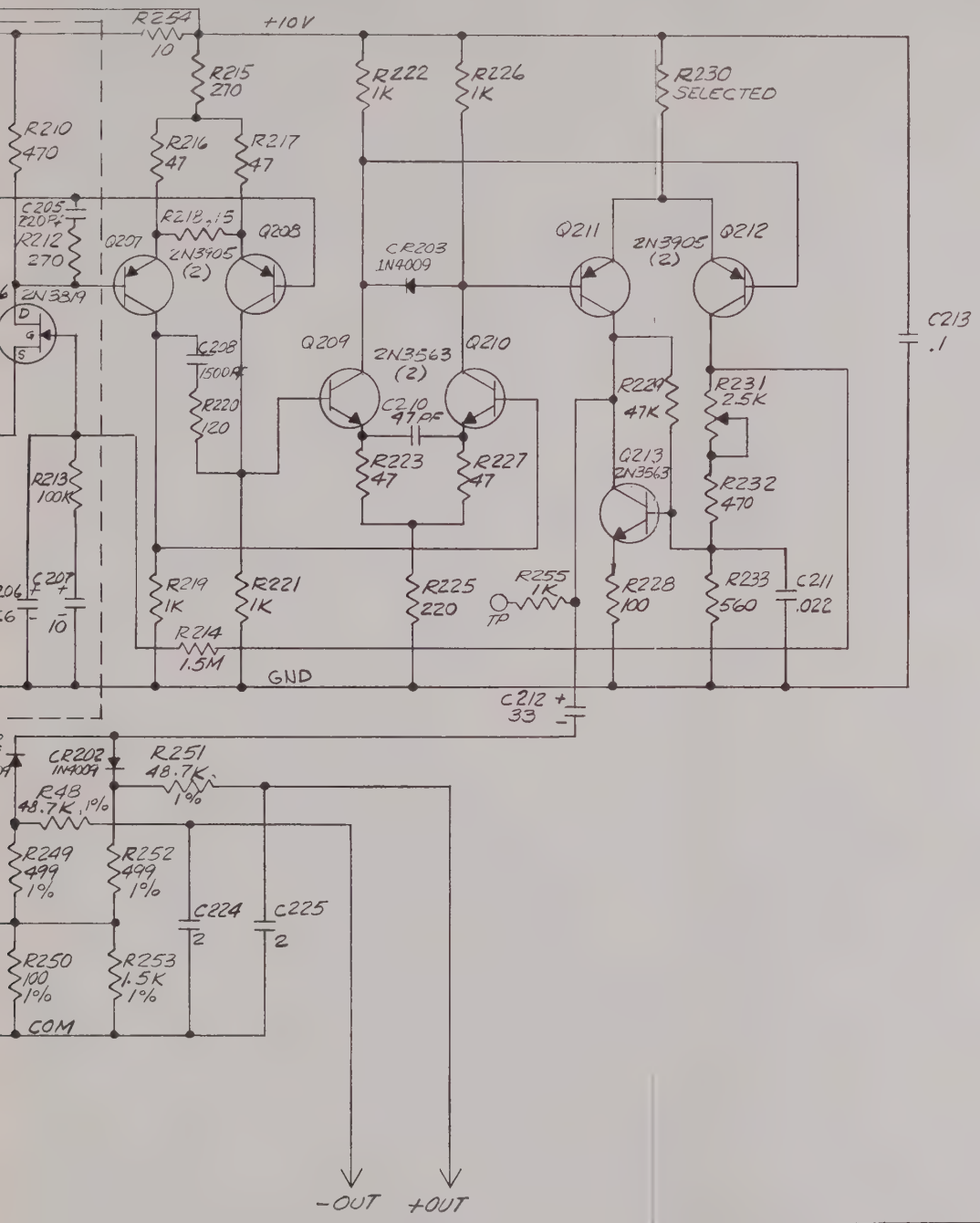
DWN: WHITELOCK DATE: 9-13-66 APPD:

SCHEMATIC - AC & DC RANGE BD.

MODEL 202 | 202-201



NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IN OHMS, 5%
2. CAPACITANCE IN MICROFARADS.
3. (*) GANGED WITH SWITCH SW102 ON RANGE BD.



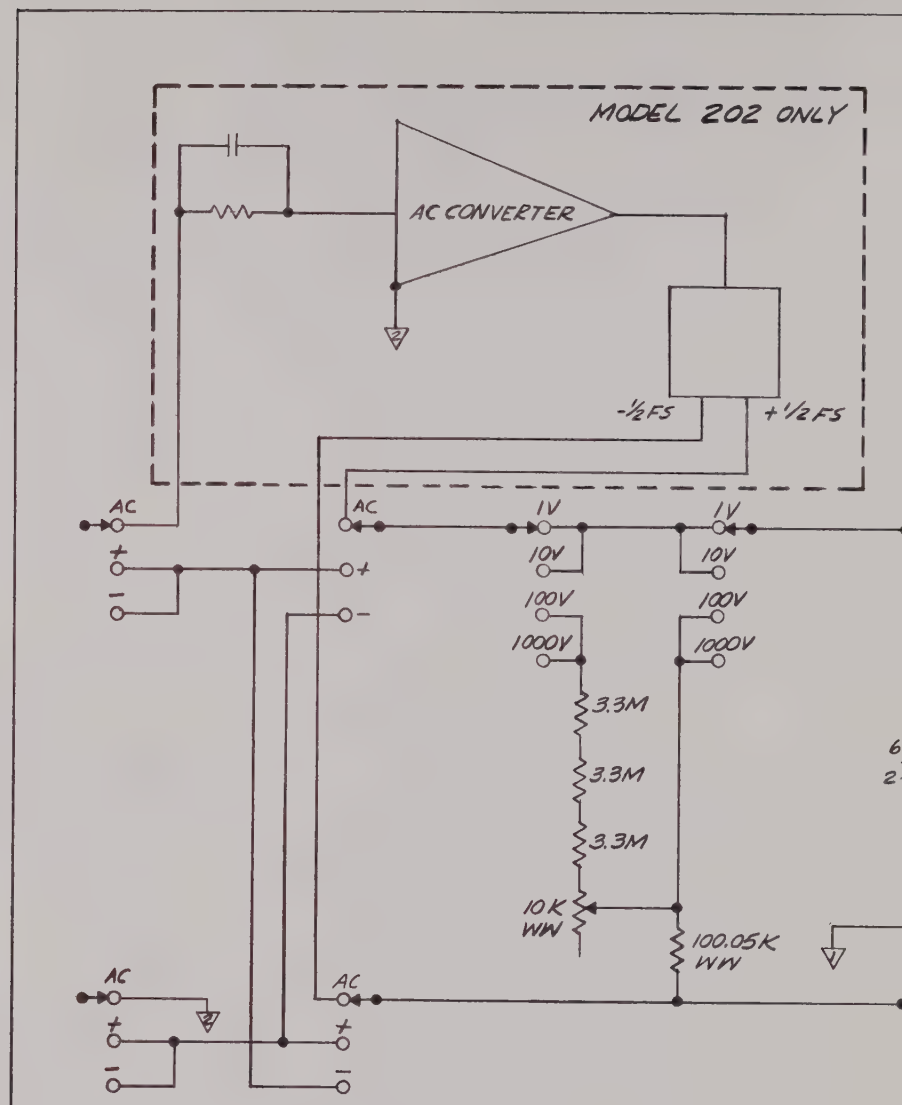
A		S.L.B.	10-31-66	
CHG.	ECN NO.	BY	DATE	APP

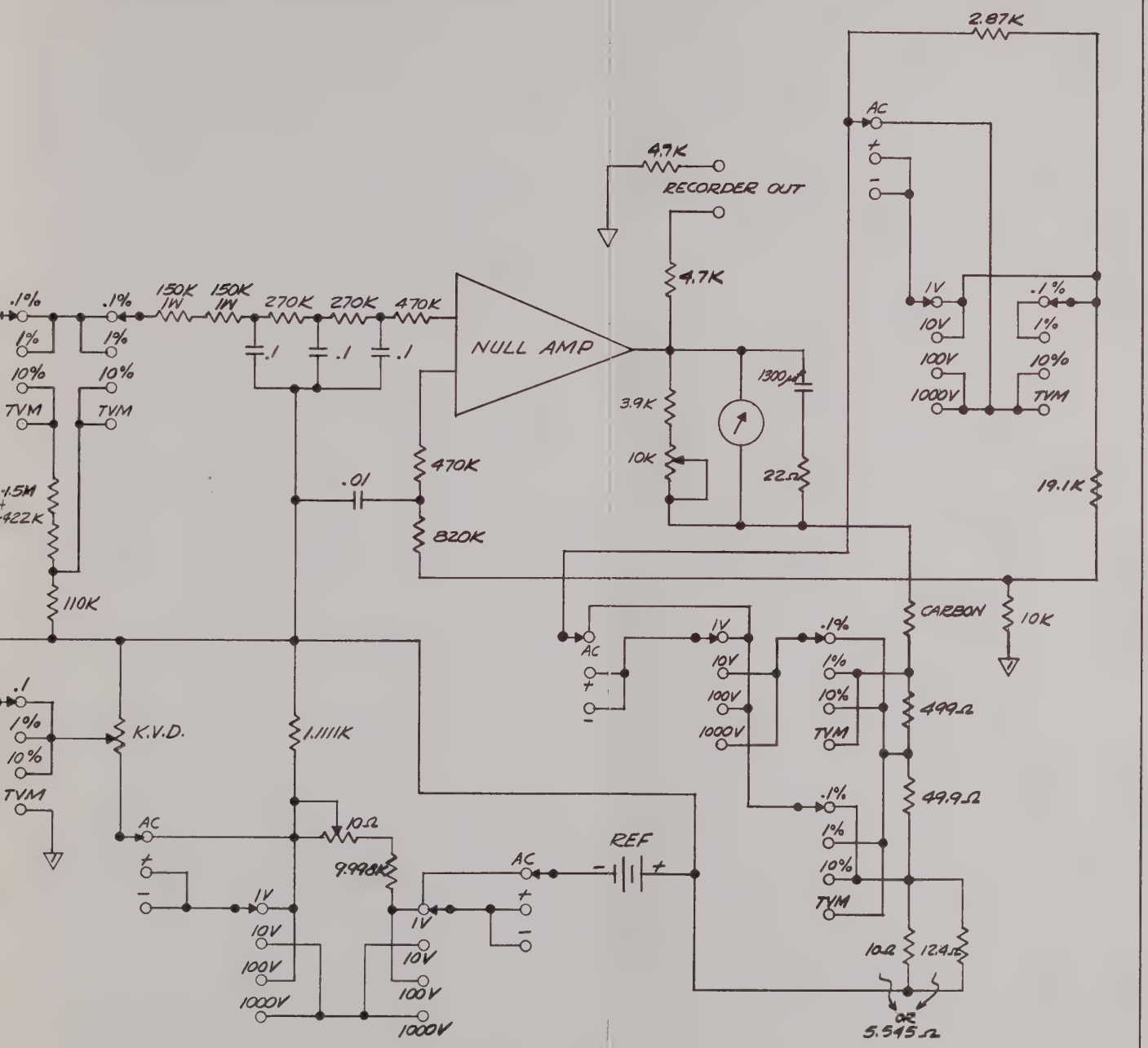
WAVETEK 8159 ENGINEER RD. SAN DIEGO, CALIF.

DWN: WHITELOCK DATE: 6-29-6 APP'D:

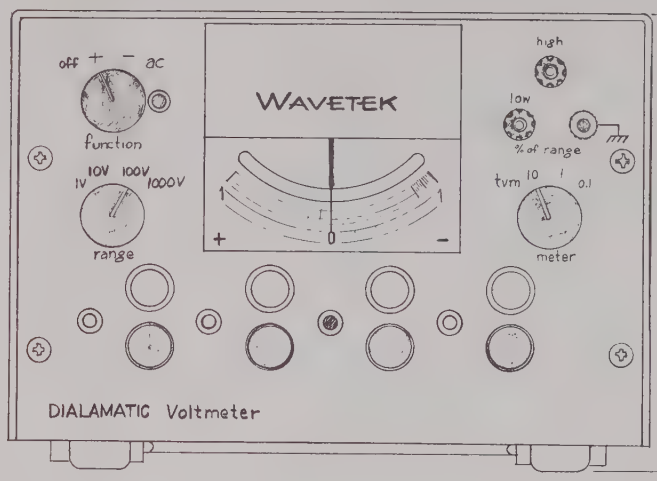
SCHEMATIC - AC CONVERTER BD

MODEL: 202 NO.: 202-204

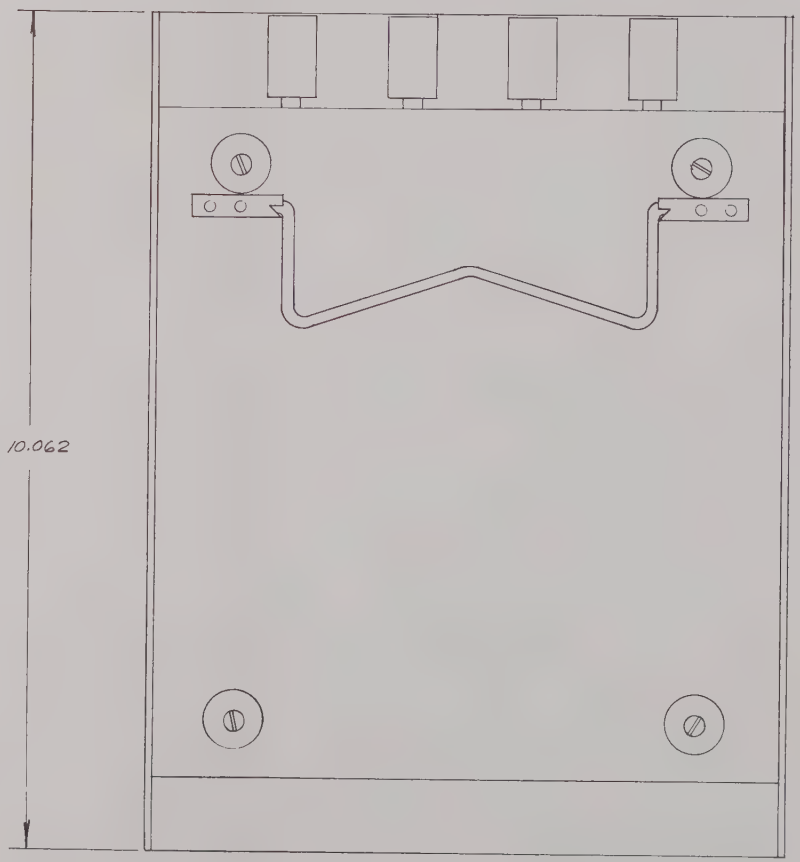

MODEL 202 ONLY
AC CONVERTER
-½FS
+½FS
AC
AC
1V
1V
10V
10V
100V
100V
1000V
1000V
3.3M
3.3M
3.3M
10K WW
100.05K WW
AC
AC
+
-
+
-
+
-



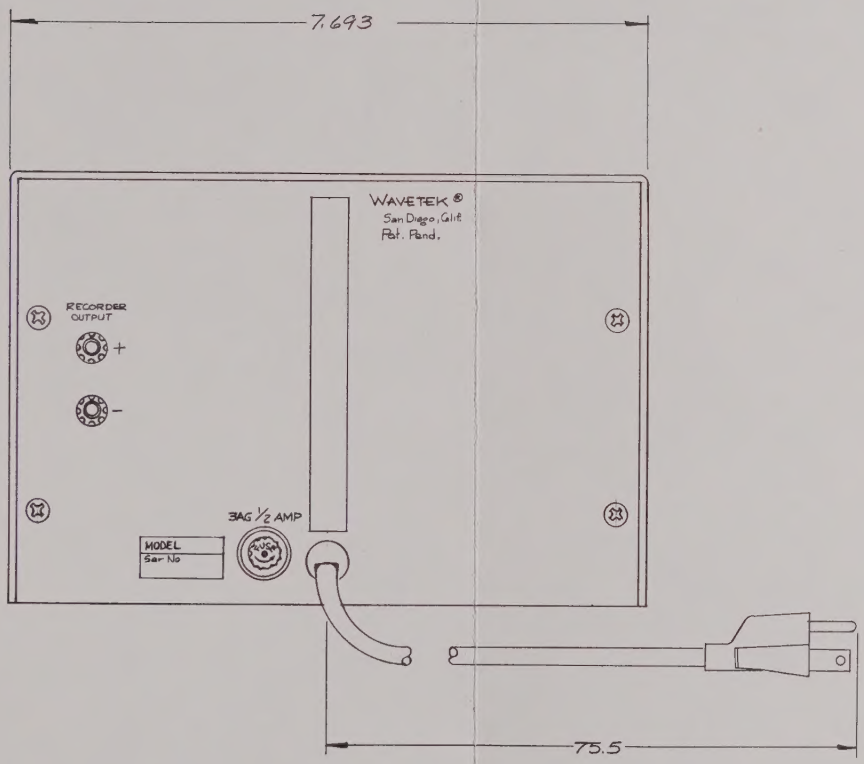
WAVETEK	8159 ENGINEER RD SAN DIEGO, CALIF.	
DWN: WHITELOCK	DATE: 12-27-66	APPD.
LOGIC DIAGRAM		
MODEL: 201 & 202	NO: 202-600	


off + − ac
function
1V 10V 100V 1000V
range
WAVETEK
high
low
% of range
tvm 10 1 0.1
meter
DIALAMATIC Voltmeter

5.531



10.062



WAVETEK	9169 ENGINEER RD SAN DIEGO, CALIF
DWN: WHITELOCK DATE: 10-6-6	APP'D :

OUTLINE DRAWING-
DIALAMATIC
VOLTMETER

MODEL: 201 & 202	NO: 202-601

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